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SIMPLE METHODS OF SEWAGE DISPOSAL.

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Among the many problems engaging the attention of sanitary engineers, that which embraces the removal or disposal of household sewage, is perhaps the most important. With the advance of natural sciences, the principles which are recognized as governing health and disease have been gradually developed, until we are now face to face with the fact that if we would be free from filth diseases, it is necessary to remove from our midst those elements which are either their direct cause or agents of transmission.

The question resolves itself into disposing of such matters in a manner best suited to the conditions and locality in which they are produced, having regard:

1. To the sanitary efficiency of the method employed.

2. To the economical attainment of the result aimed at; and

3. To the method of disposal affording some return for the means expended.

The conclusions which naturally follow the foregoing propositions, and which, from a sanitary standpoint, dominate the whole question, may be summed up as follows:

a. That wherever there is excretal refuse to be disposed of, it should be so treated as to remove or separate the solid from the liquid parts.

b. That the impurities conveyed by the liquid parts of sewage, which are more readily oxidized, are insignificant as compared with those of the solid parts.

c. That the solid parts of excretal sewage should never under any circumstances be allowed to enter a water-way; and if the fluid parts can be subjected to some artificial process of purification, and subsequently passed through the soil by subsurface irrigation, so much the better.

These are fundamental axioms which require no discussion; but it must be admitted that, thus far, serious difficulties have environed the practical application of these principles to the question of sewage disposal.

Apart from the question of health, the practice of discharging crude sewage into water-courses has its attendant evils. The solid matters will gravitate to the banks and bed of the stream, which not only obstructs natural drainage, but is liable to decompose and become offensive as the water falls, and exposes it to the action of the sun and air. Again, the more finely diffused solid particles are exceedingly hurtful to fish, choking up their gills and suffocating them. Moreover, fish breathe by means of the free oxygen which is contained in the water in which they natate, and this element being deprived of its oxygen by the admixture with sewage, the fish must necessarily die.

This fact alone, viewed in the light of political economy, should restrict the amount of sewage poured into any limited area of water; for however admissible *fresh* sewage may be as food for fish, it soon becomes stale, and in this condition acts as a poison which will eventually destroy the fish and oysters of any water area into which it is discharged.

Again, when sewage passes into a putrefactive state, the gases that are generated either in sewer pipes or water-courses, are capable of producing certain malignant diseases; but whether the illness is to be regarded as the direct effect of inhaling the mixed chemical gases, or as an expression of the consequences of inspiring a micro-organism which is reproduced in the human body, is not known to medical men—who are, however, perfectly familiar with the illness.

One of the greatest difficulties of adequately dealing with this sewage question, lies in the enormous bulk to be operated upon—equal to about 5 gallons of water to every 3 ozs. of fæcal matter—and it is therefore reasonable to suppose that, could some simple mechanical appliance be devised by which the liquid could be drawn off and separated from the solid parts, it would greatly assist in the efficient treatment of excretal refuse. The fluid part need not necessarily be passed directly into a water-course; it could be first distributed by subsurface irrigation over a sufficient

area of land, for which it would serve as a useful manure, and by which it would be effectively filtered and still further purified. The employment of such a method is the more to be recommended because, when a process of separation only has been employed, as contradistinct from a process of precipitation with chemicals, the effluent is richer in organic substances available for the nutrition of plant life, and the solid matters being excluded, the pores of the soil will not become clogged.

As to the manurial value of the solid matters retained, that must be judged rather by the practical results of the agriculturist than by the presumed theoretical values based on analytical data. The percentage of combined nitrogen, however, in this material is remarkably constant, and the phosphoric acid which it contains is also an important ingredient in an agricultural point of view.

Fæcal matter has been termed "the natural food of the soil," as it returns to the soil those elements which are taken from it by the growth of vegetable products necessary for the proper nutrition of man. By treating excrementitious matters by a process of separation, moreover, what is now a nuisance to cities and towns may be made a source of profit to the country generally, especially to the agriculturist, who would find in the solid matters a valuable guano—superior to most manures in the market—produced at his own door.

"The most fertilizing and effective manure," says Victor Hugo, "is human manure; but what is done with this golden dung? It is swept into the gulf! We send, at great expense, fleets of ships to collect at the Southern Pole the guano of petrels and penguins, and cast into the sea the incalculable element of wealth which we have under our own hands."[1]

If this so-called "golden dung" has the value that is ordinarily attached to it, private enterprise would surely be rewarded for its collection and utilization, and could well afford to pay a handsome bonus for its preservation. Agriculture, so important a factor in the country's industry and prosperity, has up to this time suffered such heavy losses from this material being "cast into the gulf," that, apart from the question of health, its interests are fully entitled to the serious consideration of political economists and legislative bodies.

It has been asserted that one prime cause of the fall of the Roman Empire was the building of the great sewers of Rome, and the consequent disastrous deflection of what might have been an enormous fertilizing material, into the Tiber, where it went to waste.

The Chinese are said to preserve carefully everything that can be used to enrich the earth for food production, and there seems to be a growing disposition, both in Europe and America, to follow their example, by devising measures and making experiments to utilize excretal refuse for enriching the soil; but we must admit that there is still a squandering of this valuable material that may well alarm the political scientist.

It is, undeniably, of the last importance that household sewage, which is now allowed to go to waste with a reckless disregard of both public health and agricultural prosperity, should be utilized in some cheap, cleanly and simple fashion; and surely, the ingenuity of man can be applied in no more useful way than to a proper solution of this important question, which embraces not only the welfare of society, but even the integrity of nations.

Passing by the difficulties which are unmistakably attendant upon the disposal of sewage in large quantities, the question comes up, how is it to be treated, as treated it must be, if the health of the inhabitants of our towns is to be considered? The methods of treatment, other than those involved in the systems by which the whole of the sewage is sent into water-courses—if, indeed, this may be considered a system of treatment at all—and in applying crude sewage for the irrigation of land, are pretty numerous; but numerous as they are, they all come under one or the other of the following classes:

1. Dealing with excretal refuse in a special way, altogether separate from large sewage drains, leaving these to conduct the waste waters of domestic and industrial operations and also the rain or storm waters alone.

2. The precipitating process, by which the solid organic and putrescible portions of the sewage are deposited in a solid form, which may be used as an ordinary manure, passing the liquid portion, in a condition more or less clear, into some stream or river.

3. Keeping the rain or storm water on the surface, or sending it into drains distinct from those conveying sewage, to be discharged into some river or stream; while the crude sewage, in a more concentrated form, is also passed into the water-course, or on the land for irrigation purposes.

4. A combination process of straining, precipitating and filtering, by which the solid part of the excreta is separated from the liquid, as it were, at the fountain head, and retained in a hermetically closed vessel or tank, under a column of water, while the fluid parts, with the ordinary water of the closet, are passed through the meshes of a fine strainer, and then either run into the soil by subsurface irrigation, or filtered through some oxidizing agent, as burnt or spongy iron, to be subsequently discharged on the surface of the ground, or into a water-course.

Under the first of these four classes there are a number of arrangements which, when taken col-

[1] Les Miserables, p. 290.

lectively, may be termed the dry system of collection.

The cess-pit and the midden were the first attempts at collecting excreta, not so much, however, for the purpose of profit as with the idea of preventing nuisance. The cess-pit need only be mentioned to be condemned. The ash pit midden, or privy, has its advantages and its difficulties; of the difficulties, the education of the people to use them properly is chief—a difficulty, however, that applies quite as much to water-closets as to middens.

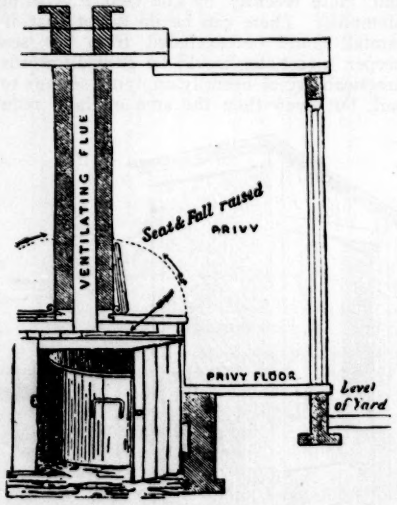

FIGURE 1.

The general principle of the ash pit midden or privy system is illustrated in Figure 1. It consists of a common privy, with a small covered ash pit, from the top of which, a ventilating shaft is taken to the roof of the house to which it is attached. The floor of the ash pit is of glazed earthenware, absolutely water-tight. The ashes used as an absorbent are emptied into the pit through the privy seat, whenever the closet is used. These pits are cleaned as often as may be necessary. This system is used at Hull, England.

The Manchester method, Figure 2, consists of a common privy, outside the house, constructed with a sunken pit, in which stands a galvanized iron receptacle, placed under the seat of the closet.

The floor of the pit is of earthenware, and the ventilation is through the flue as shown in the illustration. The door for removing the receptacle is at the side or back. In the absence of the receptacle, the ash pit can be used. The receptacle is emptied weekly.

The Rochdale method is similar to the Manchester, except that the wooden pail, generally made from a kerosene barrel, is substituted for iron, and sits immediately beneath the closet seat and on the same level of the floor, instead of below the surface of the ground, which makes removal more difficult. Figure 3 is an illustration of the Rochdale system.

The Goux system consists in lining the inside of the tub with absorbents as charred sea weed or dry earth, rammed in by a central core, so as to give a uniform lining to the tub, thus preventing splashing. This method necessitates the frequent removal of the excreta. The fæcal matter is received in the central cavity of the lining.

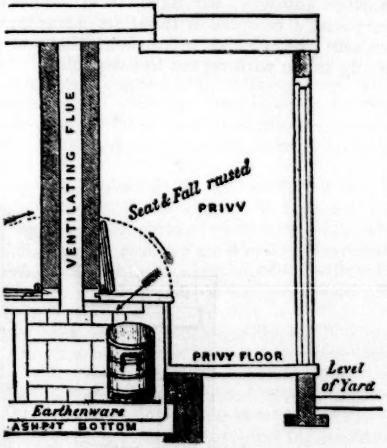

FIGURE 2.

At Birmingham, where the galvanized pails are used to the extent of some 40,000, representing a population of 250,000, the contents are collected weekly. These are emptied into a vat at the place of deposit, and some sulphuric acid added to fix the ammonia.

The object of these several methods is the conversion of the old and dangerous system of privy pits into receptacles calculated to promote health and decency, and keep out from sewers as much of the excremental matter as possible. There is no doubt whatever of the fact that either of these systems is infinitely more healthy and more reasonable in every way than the cesspool, and, personally, I am strongly inclined to think that a dry system of collection in villages and small towns, even if not in larger centres of population, is to be recommended in preference to the usual water-carriage system.

Lastly, we have among the dry systems of collection, Moule's dry earth closet, in which the deodorizing and absorbent power of the earth is applied to the treatment of excreta. This closet is illustrated in Figure 4.

However efficient as a deodorizer and absorbent dry earth may be, there are almost insuperable difficulties attendant upon its use, which have retarded its general introduction, even in country districts. About four and one-half pounds of dry earth per head per day are required to obtain a consolidated and inoffensive compost. A village of 1,000 persons would need, therefore, about two tons of dry earth per day. Moreover, it is a *sine qua non* that no liquids are to be discharged into the closet, so that it is a system which does not provide for liquid excreta; or if the air is very damp, which is the normal condition in certain places, or if the contents get moist in any way, we have, to all intents and purposes, a cesspool without its advantages, or without the special precautions that are commonly taken with regard to cesspools.

The third plan is that by which the great dilution of sewage with water is proposed to be avoided by having two distinct sets of drains, one to convey away the household sewage alone to some water-course, or to be treated by precipitation or subsurface irrigation; the other set of drains to carry off storm and street water. This was first proposed half a century ago by Mr. F. O. Ward, of England, and was subsequently practically carried out by Mr. Menzes, at Eaton, and, more recently, by Col. Geo. E. Waring, at Memphis. There can be no doubt that if the rainfall could be excluded from the sewage proper, a vast step would be gained towards the practicability of usefully applying sewage to the soil, but even then the area of land required

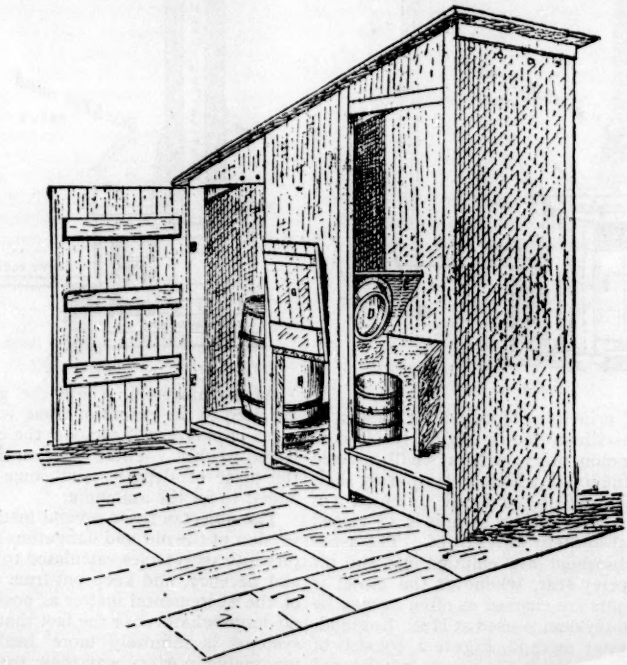

FIGURE 3.—ROCHDALE PAIL CLOSET.

A, excrement pail. *B*, ash tub. *C*, seat cover (raised). *D*, iron collar below seat, reaching slightly into pail when cover is down. *E*, hinged upright of seat. *G*, door admitting from outside to excrement pail.

We come now to consider the precipitating processes. A great number of these have been tried, but the general result seems not to have been satisfactory, since none have thus far been free from a feature which practically condemns the whole of them, viz., the employment of expensive chemicals in large quantities for the purpose of precipitating from the water certain matters which are therein suspended.

would be so great and the cost of preparation so immense that the suggestion has been considered by high authorities to be hardly practicable. Moreover, it has been pretty well established that the putrefactive decomposition of solid excretal matter in soils gives rise to the production of malarial and parasitic diseases, and that such

solid organic matters, after a time, will form a crust or cake upon and in the interstices of the soil, which gives off offensive and dangerous effluvia. Again, the sub-soil water from broad irrigation is charged with decomposing matters, and Petenkofer is not alone in his opinion that "there is no more fruitful source of disease than polluted sub-soil water which is constantly changing its level."

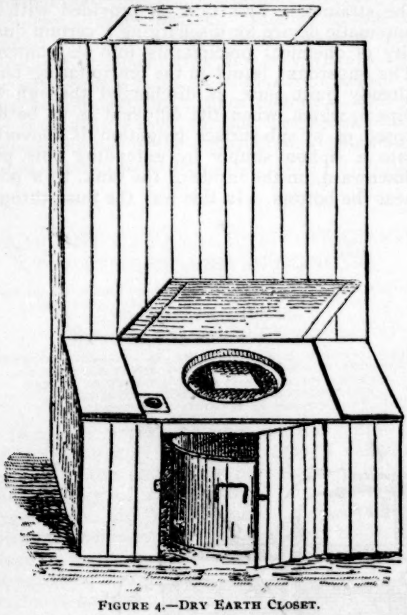

FIGURE 4.—DRY EARTH CLOSET.

The mere fact that the available land near large cities, at least, is insufficient for the disposal of sewage by irrigation, is sufficiently condemnatory of the process as an exclusive means of utilizing sewage. According to M. Lefeldt, an acre of land is required for the excreta of every twenty or thirty persons when applied by broad irrigation; while Mr. Henry Robertson, of England, in a paper on sewage disposal (*Sanitary Record*, 1884), contributed to the Sanitary Institute meeting at Dublin (1884), states that "open porous land with a good free subsoil drained six feet deep, will deal, per acre, with the sewage of 600 people," but the cost of preparing the land he estimates at from $4,000 to $5,000 per acre, so that, practically, it does not much matter which kind of irrigation be used.

The theory of purification by irrigation is that the fluid part of sewage gradually percolates through the land, and is finally carried off by the artificial under drains, while its organic constituents are subjected to oxidation by the agency of microörganisms producing the phenomenon known as "nitrification." The solid parts left in the soil are also attached, and gradually succumb to the influence of hydration and oxidation; but there is a limit to this process, and should the land become overcharged or choked with solid matters, which often occurs on sewage farms, oxidation will not proceed, and an intolerable nuisance ensues.

To prevent this the separation of the solids from the fluids of sewage is essential, and after this the effluent may be disposed of with entire immunity by a process of irrigation; or, in the absence of special objections, the effluent may be discharged into a river or other water area having sufficient volume or flow to oxidize the organic matters which are held in solution. This, however, applies only to sewage, whether mixed with rain water or not, that has been so dealt with by screening, subsidence, precipitation or otherwise, that the solid parts are removed from the liquid parts.

If our boasted scientific knowledge is worth anything, it should enable us to separate the fluid from the solid parts of excretal sewage, and to convert the latter into a good practical manure, while the fluids may be discharged into the soil, or into some water-course, in an innocuous condition.

Some three or four years ago Mr. C. T. Kingzett, the distinguished London chemist, suggested that a small portable apparatus might be supplied to each house, provided with a strainer, whereby the water of crude sewage would be separated from the solid parts; and the receivers could, by a properly organized system, be collected as often as necessary, and a clean one left in the place of the one removed. Such an apparatus, it scarce need be said, should be as simple and as economical as possible, consistently with preventing nuisance or danger to public health; and I claim for a device which I have lately introduced, that it is at once the most simple, the most effective and the most economical that has yet been proposed for the purpose. The method consists of a process and apparatus by which the solid matters of household refuse are effectively separated from the water of crude sewage by mechanical straining, subsidence and precipitation, whereby a large proportion of the suspended matters are detained in a hermetically closed receptacle, which when full can be removed and replaced with an empty one by a common laborer, while the liquid parts are continuously delivered in such a condition of purity, that they may be used to irrigate the soil with advantage, and without any danger of choking its pores; or the effluent from the precipitating tank may be further purified by filtration through iron to such an extent that it can

be discharged into any drain, sewer, cesspit, river or stream with entire immunity. The apparatus is illustrated in the following diagram:

Figure 5 represents a vertical section of the apparatus with all its parts intact, except the filter, which is omitted as it is rarely to be used. *A*, represents the receiving vessel or "receiver;" *B*, the settling or "precipitating tank;" *D*, the outer cylinder of the "strainers;" *E*, the inner perforated "strainer;" *F F*, the soil pipe connected with the strainer *E* above and below; *G*, the collar which connects the soil pipe with the receiver; *H*, the box or holder for the precipitating reagent; *I*, pipe connecting the receiver and precipitating tank for the purpose of drawing down the water to prevent slopping when the receiver *A* is detached at the cellar *G* to be removed. When detached the opening at *G* is closed with a close-fitting cap.

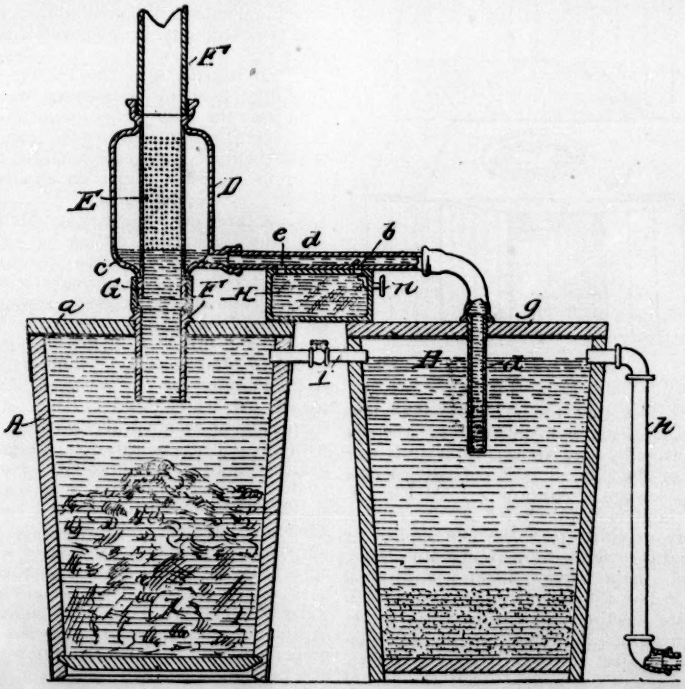

FIGURE 5.

The operation of the apparatus is as follows: All such matters as are generally discharged into the soil pipes of houses are conveyed into the "receptacle," which is removably connected with the soil or drain pipe. The coarser, undissolved matters, such as foreign bodies, ordure, and paper not yet dissolved, which the trap of the soil pipe has allowed to pass, sink by gravity to the bottom of the receptacle, while the matters that are more or less dissolved in water find their way along with the supernatant liquid of the sewage through the meshes of the strainer, and from thence by a connecting pipe *D* into the precipitating tank.

The precipitating tank receives the overflow from the "receptacle" which has passed through the strainer. This tank is provided with an automatic device for discharging a certain quantity of chemical precipitants into its contents. The supernant liquid in the precipitating tank, already quite pure, is discharged through the pipe *h*, which, when the effluvent is to be disposed of by sub-surface irrigation, is converted into a siphon simply by extending this pipe downward, on the inside of the tank, to a point near the bottom. In this way the flush through the sub-surface irrigation pipes becomes rapid and continuous until the tank is emptied.

The receivers, containing the solid parts of excretal matters, are to be collected, when full, by a properly organized system, and clean ones left in their places. These receivers should be taken directly to the usine or compost factory,

where their contents may be worked up, with other substances, it may be, into an innocuous and valuable manure powder ready for immediate application to the soil. The utilization of the solid excreta is not, however (and this is a very important matter to public bodies which have to do with the disposal of sewage), confined in any sense to its employment as a manure, or as a source of ammonia and certain salts. It may be pressed, air-dried, and employed as ordinary fuel for use in boilers or other furnaces. Further, it may be ground up with clay and lime, and converted into brick or cement after the process devised by the late General Scott, of England; or, again, it may be admixed with other materials, such as are ordinarily employed, and converted into a material for use in the construction of sidewalks, foundations of buildings, etc.

INCIPIENT CATARACT; ITS ETIOLOGY, TREATMENT AND PROGNOSIS.

Read in the Section on Ophthalmology, at the Forty-second Annual Meeting of the American Medical Association, held at Washington, D. C., May, 1891.

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In a brief paper published in the *University Medical Magazine* for March, 1889, I called attention to the underlying pathological factor in the etiology of *hard cataract*, and entered an urgent plea for the treatment of eyes afflicted with advancing opacity of the lens, before the stage of maturity. It was then claimed that by designating these cataracts as "*senile*" the tendency had been introduced to regard them as one of the unavoidable changes incident to the decline of life, and that by this means attention had been drawn away from other and more important factors in their production. It was shown that the hard and inelastic lens of even advanced life was not necessarily an opaque lens, and that approximately normal acuity of vision was quite compatible with old age. That the opaque lens was therefore an extraordinary occurrence to be explained by other causes than senility.

In my early experience, when consulted for relief from commencing cataract, the habit was to acquaint the patient or his friends with the cause of the failing vision. The opinion expressed was to the effect, that for the present nothing could be done to restore the vision—on the contrary, it would probably grow steadily worse, but that though blindness might and probably would insue in one or both eyes, vision would then be restored by removal of the "ripe" cataract. The conjunctival irritation quite habitually present was relieved by mild astringents, advice given regarding the general course of life in its relation to the laws of hygiene, and the patient requested to return occasionally for inspection. Thus the individual and the family were sent away with an abiding solicitude hanging like a cloud over the household, the anxiety —alleviated only by the hope when the worst had fallen—relief would come in the extraction of the mature lens. A more careful study and a steadily widening experience, have convinced me that in a considerable group of these afflicted persons a more hopeful prognosis can be given. In many of them the progressing opacity can be arrested; in still others the rapid increase can be greatly retarded, and failing in this the eye will be in a more favorable condition for operative interference, by virtue of the treatment instituted. For many years, I have with increasing confidence given this opinion to persons applying for relief from their failing sight, consequent upon the blurring lens fibres and the associated conditions, which it is here claimed sustain to each other an etiological relation, and are in large measure amenable to treatment. In the present paper no new facts are brought forward, but at the request of the chairman of the Section it gives me pleasure to once more call attention to the views before expressed, which I do with increased confidence after two years of additional experience, and a more careful study of the data at my command. The clinical picture I have in mind does not include those cases of stationary opacity in the peripheral cortex of the lens, occurring in otherwise normal eyes. Every surgeon must have had frequent opportunity to study these cloud-like bands hanging between the lenticular pole and periphery, usually situated in one of the lower quadrants, or a dense bank of opacity, well down in the periphery, remaining year after year unchanged, and causing the individual no inconvenience. That no misunderstanding may occur as to the claims to be made for the treatment of beginning cataract, I wish to say that I have never seen an established opacity of the lens disappear. In my experience, an opaque spicule once formed has remained or increased. When, under treatment, vision has improved, it has not been from the removal of the opacity in the lens fibres, but from the improved condition of the vitreous body, the retina and choroid. Nor is it intended to include in this study directly, the considerable group of cataracts, which, by common consent, are regarded as "*complicated*" or secondary, *e. g.*, the opacity of the lens which is a part of the closing scene in eyes lost from retinal detachment, inflammatory glaucoma, and irrido-choroiditis. No form of eye disease is more familiar to the surgeon than the posterior-capsular opacities *et al.*, which accompany and are dependant upon the more

pronounced forms of intra-ocular disease involving the choroido retinal tract. While these violent forms of disease are not included in this discussion, they are alluded to as pointing in the most unmistakable manner to the important possible relation existing between disease involving the nourishing membranes of the eyeball and the impaired nutrition of the vascular lens. It is probable that we might, with the greatest propriety, regard these complicated cataracts, so-called, as illustrations of a more advanced or violent type of disease, than that here contemplated. There is, however, a very large group of eyes suffering from irritation and chronic inflammatory processes of the retino-choroidal tract which do not present the gross ophthalmoscopic changes which characterize the destructive diseases above referred to, but which may, and doubtless do lead up to them under provocation. Eyes which by virtue of their chronic or subacute pathological state are ripe for more destructive processes, which are lighted up by the onset of some constitutional disturbances, or by some extraordinary exertion or exposure to light or heat. They may or may not be associated with some systemic dyscrasia. Frequently, commencing early in life, they are steadily progressive unless arrested by appropriate treatment, and sooner or later undermine the health of the eyeball, rendering it throughout life especially liable to various forms of acute disease, and are the more or less direct cause of the serious maladies to which the eyes are subjected during and after the middle period of life. To this catagory belong especially the eyes starting in life with errors of refraction.

The clinical picture presented by this group of *weak eyes* is important to our purpose. Subjectively, we have the familiar picture of asthenopia. They present, however, a characteristic group of objective phenomena which I design to connect with the forms of disease so frequently seen after forty-five years of age, and especially with opacification of the lens. Much has been written to establish the relation of cause and effect between eye strain and the inflammations involving the choroid and retina and the external tunica. A bibliography of this field of observation is no longer necessary, since it has been well established in the practice of ophthalmic surgeons. The woolly choroid or fluffy eye-ground, with the two capillary nerve surfaces; the ragged nerve margins; the ripe-peach choroid; the narrow crescent of choroiditis embracing the temporal margin of the optic nerves, and its steady advance to the large atrophic conus or posterior staphyloma of the distended myopic ball, are well understood, but I am not so sure that we habitually connect with these intra-ocular disturbances the affections of the external tunica. The chronic hyperæmia of the conjunctiva, and dilated anterior perforating vessels, the swollen and red coruncles, the blepharitis celiasis, the increased secretion and partial retention of tears, the recurring styes, are frequently but the external expression of the grave disturbances of the circulation of the intra-ocular tunica.

It were cause for surprise if, in the presence of this general disturbance of the nourishing membranes of the eyeball, the vitreous body and crystalline lens, divorced as they are from a direct vascular supply of nourishment, did not frequently suffer in their nutrition. Indeed, reasoning *a priori*, one would anticipate a proneness upon the part of these avascular structures to accept disaster, in the presence of any cause which would impede their ready supply of nutriment.

I have elsewhere urged that the chronic hyperæmia of the very vascular choroid, however produced, by increasing the contents of the globe, brought about increased intra-ocular tension. That in the readily yielding sclerotic of youth is presented to us the interesting clinical phenomena of increasing refraction, and finally progressive myopia. Later in life, however, the changed anatomical conditions materially alter the clinical picture. Here, in the presence of the rigid sclera, we find the conditions which give rise to the cases of violent asthenopia, from intra-ocular pressure, which too frequently passes over into the better appreciated and easily recognized phenomena of glaucoma.

The mechanical interference with the circulation is important. It is obvious that increased intra ocular tension, however slight, must produce the mechanical result of interference with the circulation of blood and secreted fluids through the organ. The veins being more readily compressible than the arteries, would not as readily, under pressure, empty the eye of its venous blood, which, as a physical necessity, would control in a measure the ingress of the nourishing arterial supply. By this mechanical means, the circulation would be at least measurably retarded, and the nutrition of the organ suffer a proportionate interference. In like manner the lymph channels and absorbents would be in a measure defeated in the proper performance of their functions. It is simply reasonable to suppose that these avascular tissues, the vitreous body, the lens and cornea would be prone to suffer harm, and the correctness of such reasoning is borne out by clinical experience, since in it we find a sufficient explanation of the steamy cornea of inflammatory glaucoma, the hazy vitreous with its web-like opacities in irido-choroiditis or cystitis, and the swollen, opalescent lens, with peripheral spiculæ of opacity, and the steamy nucleus of incipient cataract. In youth these phenomena are averted by the relief of pressure through the expansion of the globe,

but nevertheless result in the evils of progressive myopia.

While the uncorrected errors of refraction, particularly in the educated classes, and in those whose vocation demands accurate vision at a near point, are doubtless the most frequent cause of the choroidal conditions which are here described, there are numerous other causes, which are sufficient in themselves to set up and maintain an analogous choroidal state, and are equally baneful in producing the dangerous sequelæ which befall the eye after forty years of age. Among the most important of these causes is exposure to light and heat: *e. g.*, in the case of the artisan at his work-bench, facing, with his unprotected eyes, a window or gas-jet for many hours in every day; the cook over the heated range; glass-blowers, puddlers, stokers and engineers. Such persons are quite uniformly the subjects of subacute choroiditis, presenting pigment clouds and absorption splotches in the choroid, and red optic disks, with blurred margins, and very often with fine webs in the vitreous, or impaired transparency. It has fallen to my lot to see many examples of this, and, in not a few, posterior capsular opacities and opaque spiculæ in the margins of the lens. At my request, Dr. George E. de Schweinitz examined twenty-five men employed in one of the most extensive iron works in this country, selecting those whose employment exposed them to the intense light and heat of the molten metal. With only two exceptions, these men were subjects of well-marked choroidal disturbance. It was interesting to note that the most marked changes were present in that eye on the side which the man habitually turned toward the furnace in working the heated metal. Other causes were carefully excluded in every case.

Another fruitful source of trouble is the prevailing notion that it is best for the patient to avoid the use of presbyopic glasses as long as possible. It is obvious that all the evils attending upon eye-strain are here present even in the emmetropic eye, and that, too, at a period of life when the attending dangers are enhanced.

I recall the case of an eminent clergyman, æt. 50, with emmetropic eyes, who, although an industrious student and author, had not worn glasses. He came complaining of burning eyes, with a sense of fullness or tension, during and after his work, and severe occipital pain, which caused him not a little anxiety, because of its possible grave import. He had marked choroido-retinal irritation, and suffered greatly from insomnia. He received presbyopic glasses, and in a few weeks his headache and insomnia had disappeared, and with it his anxiety about his anticipated nervous break-down.

A still more marked example of the possible results from this erroneous habit of avoiding the use of glasses to correct presbyopia was presented in the following case:

A postmaster, in robust health, æt. 49, with a low grade of H. As, had managed to attend to his duties without the aid of glasses. He complained of muscæ, blind spells, diplopia on looking up after reading — which occasionally persisted to his great annoyance — and insomnia. He had pin-head pupils, shallow anterior chambers, red and watery eyes, increased tension, and dilated anterior ciliary vessels. His vision, however, was nearly normal, but failed quickly. There was no contraction of the field. The symptoms slowly disappeared under correcting glasses, but not until after prolonged use of homatropia and rest. Here, too, there was well-marked eye-ground changes. Glaucoma in this case seemed to be imminent.

In looking over the clinical records I have been struck with the much greater frequency with which the lower part of the lens was involved than the upper, the commencing opacity almost habitually being below. It is in the lower part of the choroid also we ordinarily find the most marked pathological change, in many cases, particularly in clerks who sit facing window or gas light at their work, or in the case of artisans who are frequently compelled to stand at the work bench facing the light.

There is probably no question in the minds of ophthalmic surgeons regarding the causes of the choroidal engorgement and disease, but it is my purpose to show, that there is a positive relation between this choroidal state and the lenticular disease. That these deductions are not based upon purely theoretical grounds find ample demonstrations in the following statistics gleaned from my private case-book by Dr. John T. Carpenter, Jr.

A brief analysis of eighty cases with incipient cataract gave the following interesting results. The ages ranged from one æt. 26 years to one æt. 87 years, and presented all stages of development of the opacity.

In *thirty-seven* cases there was a clear history of "weak eyes" and long standing asthenopia, *i. e.* headache following use of the eyes; recurring styes, olepheritis, etc., often dating back to childhood. In the remaining cases there was either no note bearing upon this point, or it was noted as absent. There was demonstrable refraction errors present in *fifty-eight* cases—either in one or both eyes. These errors were also noted as present if, *e.g.*, the individual brought his glasses, worn for distance before the failing vision from his cataractous lenses was observed, even though the opacity was too far advanced to permit the determination of the refraction at the time of the consultation.

In the remaining cases it was either impossible to determine the state of the refraction, or its

study had been neglected since. No information could be gained from the records. Vitreous opacities, webs, etc., are noted as observed in *twenty-two* of the cases, and chroiditis in *fifty-eight*. In many of these areas of pigment absorption, macular disease, choroidal splotches and other gross changes are carefully described, as present in one or both eyes. The wooly choroid, crescents of choroiditis at margins of the nerve and pigment absorption, "ripe peach" choroid etc., are included in this group, if the conditions were sufficiently marked to be justly regarded as a disturbing factor in the nutrition of the eye.

In some instances the opacity was too far advanced to admit of any study of the fundus oculi, on one side, but if choroidal changes or vitreous opacities were present in the better eye, the case was included as one of choroidal disease, whether the eye in which the study was made presented lenticular opacity or not.

The frequency with which the affections of the external tunica was noted as present forms also a striking feature of this group of cases. The conjunctival irritation, partial retention of tears, swollen caruncles, and blenorrhœa of the lachrymal sac were observed in *forty five* cases. In the remainder the record was silent. The frequency with which affections of the lachrymal sac had been noted and treated, was a source of surprise.

The number of cases might have been greatly enlarged, but these were sufficient to show the very obvious relation which exists between the formation of opacities in the crystalline lens, and local pathological conditions, and if they serve to show that incipient cataracts, in many instances, belong in the catagory of possible preventable diseases of the eye, the purpose of the essay will have been attained.

Among the many interesting details which appear in the study of these cases, is the fact that after the opacity has advanced sufficiently to prevent the use of the eyes at near work, and to exclude the light, that then the asthenopia and external inflammation gradually subsided. It is probable that the enforced rest thus secured to the eye permits also the gradual subsidence of the choroidal disease.

In this fact Nature affords us a suggestion for the management of these cases at an earlier stage in their history, when by rest and appropriate treatment, it is still possible to cure the choroidal disease. If the progress of the opacity is not by this means arrested at a point where useful vision is still possible, the prognosis upon operative interference would be more favorable than would be the case in a badly nourished organ.

The following cases related in some detail have been chosen as typical of the conditions described, and as incidentally illustrating the practical advantages which must follow advice based upon the views here set forth.

Case 1.—Incipient Cataract, Choroiditis, Asthenopia, Failing Vision. Mrs. L. æt. 63, consulted me in May, 1879, complaining of weak eyes, failing vision, headaches, to which she had always been subject, itching and burning of the eyelids. Recently she had made repeated changes in her reading glasses but without material benefit—three times within the year.

The caruncles were swollen and the conjunctiva was injected. V $\frac{20}{70}$ in each eye. She wears +.50 D. for near work, and with it reads Jr. 4. with difficulty.

The ophthalmoscope reveals a hazy image of the details of the fundus. The anterior chamber was shallow, pupils reacted to light and shade, and dilated to large medium under a mydriatic. The lens was now seen to be opalescent throughout, and at the inner border there was a cloud-like opacity and a few spicules of opaque lens projecting along the posterior capsule toward the pole.

In the left eye there were also numerous opaque spiculæ along the border of the lens, and a cloud in the outer part. There were in both eyes vitreous webs, which, with a convex glass, could be seen to move with a slight to and-fro movement with the motions of the eyes. The use of the eyes for all near work was forbidden, and a tonic and alterative treatment advised.

A weak solution of atropia with an astringent wash were directed locally. A month later V. had risen to $\frac{20}{40}$ in each eye, and the general discomfort and headaches much diminished. She then received +9, for reading, and was allowed to do a moderate amount of work. In 1883, she was last seen. The vitreous webs still remained, but the swelling and opacity of the lens had not increased, a much clearer view of the eye-ground could be had, and her general condition had much improved.

At her first visit she had been advised of the threatened cataract, and that in all probability her vision would grow worse. The gratifying result of treatment was a surprise both to the patient and myself. Without such treatment there can be but little doubt that the lenticular opacity would have advanced to ripe cataract.

Case 2.—Hypermetropic Astigmatism, Asthenopia from childhood, Failing Vision, Choroiditis, Incipient Cataract. Progress arrested. Mrs. T., æt. 60, came in January, 1884, because of recent rapid failure of vision, both for near and distant objects, and that she could not get glasses to aid her.

O. D. V=$\frac{20}{60}$ O. S. V=$\frac{20}{70}$. Not improved by any glass. No note was made of the external condition of the eyes.

She had been a great sufferer from headache all her life; had even as a school girl recognized the relation between the use of her eyes and the onset of pain in her head. Both lenses were strong-

ly reflecting. After dilating the pupils both lenses were opalescent, nuclei plainly outlined, and sectors of lenses visible, and there were innumerable small spiculæ in the periphery. With the strong illumination of the inverted image, the blurred details of the fundus could be seen, revealing well-marked choroiditis. She was on her way to her home in Kentucky, and could not stay for treatment. She was apprised of the nature of her trouble, and the importance of rest for the eyes was insisted upon. Potassium iodide prescribed internally, and a weak solution of sulphate of eserine locally. She returned a year later, January, 1885, having at first experienced relief from her headache, but lately it had returned, and with it increased fogginess of her vision. Potassium iodide and bromide were now prescribed, and homatropine locally, together with protecting smoked glasses. Numerous unsuccessful attempts were made to improve the vision by glasses. After a month during which the treatment had been faithfully carried out, she selected without difficulty, although the opalescent condition of the lens remained as before, O. D. +.50 s. ⌒—2c. ax. 150°V=$\frac{20}{25}$. O.S.—.75c.ax. 90°V.=$\frac{20}{30}$. These glasses were prescribed for distance, and another calculated from them given for reading. The internal use of potassium iodide, alternating with iodide of iron, was continued for another month, when she was allowed to return to her home. Two years later she sent report by a relative that there had been no return of trouble, and that she was using her eyes without anxiety or pain.

In this case the usual train of symptoms and local appearances were presented which characterize the incipient stage of cataract, viz.: the failing or "foggy" vision, the swollen opalescent lens and peripheral spiculæ. Under treatment, which improved the health of the choroid, the vision improved, notwithstanding the fact that no change had taken place in the opacity of the lens fibres. The mixed astigmatism in the right eye, and the simple myopic astigmatism in the left, were doubtless important factors in the life-long history of these eyes.

Case 3. Choroiditis, Simple M. As., Vitreous Opacities, Incipient Cataract.—Mrs. H., æt. 63, November 10, 1884, complains of recent rapid failure of vision, which has progressed until she can no longer get a glass with which she can read. Has been near-sighted since about 15 years of age. Is certain that in early childhood she was not myopic. Any attempt to look at near objects brings on smarting sensation in the lids, and lachrymation. Eyes are red and watery, and have been so for many years. Strong white reflex from the small pupils on both sides, and anterior chamber in both eyes shallow. After dilatation both lenses were found to be opalescent, steeple-like projections from all parts of their periphery, the centres still remaining sufficiently clear to permit a foggy view of the eye-ground. There were numerous vitreous opacities, and a general haziness which appeared to be due to the untransparent vitreous body. Through it, however, with the inverted image, could be seen numerous splotches in the choroid, and large atrophic crescents to the temporal side of both optic nerves. O. D. V. = $\frac{20}{100}$, O. S. V. = $\frac{20}{100}$. She selects concave glasses, but they do not improve her ability to distinguish the letters. She received potassium iodide and bromide, āā gr. v, t. d., smoked glasses, and a solution of homatropine to be instilled four times each day. Also a wash of boracic acid, and the tear ducts were syringed with the same solution on alternate days. In two weeks she volunteered the statement that her vision was much clearer, — V. = $\frac{20}{64}$? without glasses. Treatment was continued from November 10, 1884, to December 9, 1884. She then selected readily the following formula for glasses: O. D. — 2.75 c. ax. 105° V. = $\frac{20}{30}$ —. O. S — 2.25 c. ax. 75° V. = $\frac{20}{25}$ +. The homatropine was then stopped, and the correcting glasses given, to be worn, except for near work. The potassium iodide was continued. A week later she received for reading O. D. + 2.75 c. ax. 15°, O. S. + .50 s.⌒ + 2.25 c. ax. 165°.

August 28, 1888, Mrs. H. came by request. V. = $\frac{20}{40}$ with each eye. Has worn her glasses constantly with great satisfaction. The conjunctiva is healthy, the choroidal splotches and crescents remain, but active inflammatory processes have disappeared. There is no swelling of the lens, but the opaque spiculæ are as before described.

November, 1890, Mrs. H. returned, suffering from a relapse. V. had sunk to $\frac{20}{100}$, she was suffering from headache, aggravated by any attempt to use the eyes or by exposure to light, and was afflicted by marked insomnia. The caruncles were swollen, the conjunctiva of tarsi soaked in tears, the eyes being red and watery. She was greatly annoyed by constant "itching" of the lids. After reading for a few minutes the page blurred, and she was forced to desist. The anterior chamber was shallow, irides reacted sluggishly, and the ophthalmoscope afforded only a foggy view of the eye-ground. Through the dilated pupils, a fine web and a granular detritus could be seen with + 4 D., moving slightly to and fro with each movement of the eye. The lens was swollen, but no new opacities. The relapse had followed an attack of influenza, which had greatly depressed her general nutrition. She was much alarmed, since a sister had but recently suffered an unsuccessful operation for cataract, at the hands of a homœopathic surgeon, and a brother had just placed himself under my care for rapidly increasing opacity of the lens, associated with vitreous opacities, bad choroiditis and myopic

astigmatism. Under treatment by homatropine locally, rest and smoked glasses, and the internal administration of tonics and alteratives, the headache, insomnia and local inflammation slowly subsided once more, and the vision steadily improved until, in the following February, 1891, she was once more able to read the letters in xxx at 20° with some difficulty, and she was discharged from any active treatment, having for the past month used a wash of boracic acid and a weak solution of eserine locally.

Case 4.—Miss S., æt. 81, came complaining of failing vision, violent headaches, giddiness and nausea, which followed any protracted use of the eyes. She had used convex glasses for reading up to her 78th year, when she discovered that they were no longer needful. She had always been subject to attacks of headache, which she said made her eyes weak. O. D. V. = ⅛, O. S. V. = ½. Slightly improved by concave glasses, confusion letters miscalled T +? Eyes red and watery, caruncles swollen, conjunctiva injected, pupils dilated, large medium under homatropine. Lens in both eyes is strongly refracting, nucleus steamy and plainly outlined. In extreme periphery of both opaque spiculæ are seen shooting toward the pole in both posterior and anterior cortex. All the conditions more advanced in right eye. There was a large conus embracing the temporal margin of the optic nerve, semi-atrophic at the nerve margin, and imperceptibly losing itself in less marked choroidal changes as the macular region was reached. There was a woolly eye-ground throughout, and in places advanced pigment absorption. In O. S. the same conditions were present. There was no albuminuria or glycosuria. She was placed upon syrup of hydriodic acid internally, boric acid wash and homatropine locally. In a week the headache was greatly alleviated, the external redness and irritation was much better. At the end of a month she had so far improved that she experienced no difficulty in selecting correcting glasses, O. D. — 1.50 ◯ — 1, ◯ ax. 105° V. $\frac{20}{15}$, O. S. — .50 ◯ ax. 30° V. $\frac{20}{20}$ dif. —. The vitreous haze had disappeared, the eye ground was greatly improved, the anterior chamber was of normal depth, lenticular opacity unchanged. T. *u.* No headache. There are no changes in the lenticular opacity. She received her glasses for constant wear in October, 1890, and a suitable formula for reading. All went well until the following January, 1891, when she returned, suffering from dim vision, headache and insomnia, which she said was brought about by too constant use of the eyes in working over Christmas presents for her friends. Under the same treatment the symptoms subsided, but V. in O. D. had sunk to $\frac{20}{50}$, and there was a distinct increase in the number and size of spiculæ in the lens. In April, V. remained as before, $\frac{20}{50}$, O. S. $\frac{20}{20}$ with difficulty, and the intraocular conditions were approaching a condition of health.

It is not my purpose to weary the Section with a report of cases, only so far as is needful to present the clinical picture I have in mind. It will be observed that in the foregoing cases, there is a distinct history of long standing eye trouble, either recognized as such, or obviously present as indicated by the asthenopic history. The cases brought forward are simply examples taken from a large group, and are not intended to carry weight by their numbers. In each case the inflammation of the external tunica and the choroiditis were present. The results of treatment were very gratifying.

In my former paper, I presented a condensed statement of 64 cases of incipient cataract, hurriedly collated from my private case-books by Dr. Ring. In the preparation for the present paper, the deductions are based upon still other cases, taken from my private records, carefully tabulated by Dr. Carpenter, but do not materially alter the results based upon the smaller number. In it, however, are included not only incipient but mature cataracts. It is obvious from this statement, that figures cannot accurately express the true state of affairs, *e. g.*, the table shows over 70 per cent. of demonstrable intraocular disease. Had it been possible to study the eye-ground in all cases, it is probable that this percentage would have been still higher, since it was rarely absent where such examination was possible. There was a distinct asthenopic history in 47 per cent. of all the cases, and refractive error in 70 per cent.

In closing this paper, I repeat the conclusions closing the former paper, since a further study and widening clinical experience have served to strengthen the conclusions there expressed:

"In the views here expressed we find additional argument favoring the great importance of carefully correcting the refractive defects in the eye, since they lie at the foundation of certain diseases which strike at the very root of the vital processes upon which the health of the eye depends. It would seem to justify, furthermore, the conclusion: That, *while opacity of the lens is a disease of advanced life, it does not, in all probability, depend upon senile change, but is originated in local pathological states involving the nutrition of the eye itself.* That hence, in the stage of incipiency, it is amenable to treatment by such measures as are calculated to remove the choroidal disease upon which it depends. That if these deductions are true, we are justifiable in giving a more hopeful prognosis to many persons who apply for treatment with incipient cataract. That if treatment fails to arrest the progressive degeneration in the lens, by virtue of the treatment adopted, the eye will be in a better condition to submit to the trials of operative interference."

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HOW SHOULD CATARACT OPERATIONS BE PERFORMED?

Read in the Section of Ophthalmology, at the Forty-second Annual Meeting of the American Medical Association, held at Washington, D. C., May, 1891.

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That the technique of cataract operations is the most important element in success, no ophthalmic surgeon questions. Every improved step in the removal of an opaque lens has advanced the percentage of cures, until failures are the very rare exception, to a generally acknowledged fact that cataract extractions, formerly so fatal to the eye, have become the most perfect of surgical procedures. As a young graduate I found myself in Paris, the pupil of the elder Desmarres, when cataract extraction was by no means a common operation because of its difficulties, its dangers and its frequent failures. The common cataract operation of my early professional life was couching, a procedure that most of the ophthalmic surgeons of the present day have never seen performed. As you know, it was the displacement of the opaque lens from its capsular bed in the vitreous chamber, so as to free the pupil and allow light to form pictures upon the retina. The immediate and momentary results of this operation were very brilliant. The staff needle was the magician's wand. With it the blind eye was apparently touched, and sight was instantly restored. In the twinkling of an eye, from seeing nothing, the patient could behold the face of the surgeon who had performed this miraculous cure, and would be loud in his expressions of gratitude. The operation bore success upon its very face, and was declared such to the admiring class of professional attendants. This was in the early days of Napoleon the Third, and in France chin beards were in favor. If the surgeon were ambidextrous, he would steady the head of the male patient firmly, holding the beard with one hand, while with the other he would plunge the needle into the temporal side of the eye, and make the point appear in the pupil from behind the iris. In a moment the lens would be forced out of its position, through hyaloid tissues, into the lower part of the vitreous chamber, where it would be left resting against the retina and ciliary border. By changing hands in case of double cataract, the other eye would be in like manner impaled, and the lens displaced from before the pupil. This performance was truly the *coup d'état* of the operating room. Two brilliant, successful operations for cataract would be scored. The lids were then closed by strips of black court-plaster, and the patient sent to the ward, from which only a limited number reappeared with sight. In a large number of those operated upon, painful inflammations would sooner or later set in, to the destruction of the vision which a momentary glimpse had promised to the patient.

At that time, when couching was of daily occurrence, I saw but very few extractions. The operation was deemed too serious for general application, and was rarely attempted by the most skilful. For it patients were selected and were carefully prepared by days of medication, and also days of training, so that the eyes could be kept quiet while the manual was being perfected with the broad knife. The patient was put to bed before the operation was commenced, and every precaution was used to avoid motion of the body during the whole bed treatment. The eyes were kept carefully bandaged for days. With all of these precautions, failures were so frequent as to deter many blind persons from accepting the ordeal. If every other eye turned out well, the successful surgeon was satisfied with his work, and was congratulated by his colleagues.

What great changes have been brought about in my personal experience! From the satisfaction of not losing more than 50 per cent. of eyes under cataract extraction, some at the present day feel unhappy if they lose a single eye out of a hundred cases of simple senile cataract operation. All of this the improved technique of the operation has accomplished. The ideal cataract extraction seems nearly attained by the methods now adopted. Asepsis and antisepsis have largely brought this about. To have absolutely clean instruments, as well as sharp ones, is a very important integral part of the work. There was a time in my early experience when every cataract patient had to be especially prepared by days of medication and dieting before they were made fit, or as we now see it, before they were made unfit, to undergo the operation of extraction. The instruments used were considered in good order provided there were no rust spots upon them. Our present knowledge, that invisible pathogenic germs introduced into wounds by bright instruments excite destructive inflammation; also that active purgation is not the universal panacea for reëstablishing or maintaining health, has revolutionized the work of the ophthalmic surgeon. He now devotes more time to the purification of his instruments, his hands, and the eye to be operated upon, and less to the disturbance of the healthy natural condition of his patient. At the present time, most of my cataract extractions are made on the day that the patients present themselves for treatment. In hospital practice, they are sent from the free dispensary to the operating room, a warm bath in transit, for general cleansing purposes, being the only preparation made. My method of cleansing instruments is to plunge them into boiling water. I prefer this to soaking them in a carbolic or a boric acid solution. I find the boiling water the most speedy antiseptic or aseptic treat-

ment, without detriment to the cutting quality of the instruments. After the instillation of a 4 per cent. solution of cocaine for five minutes, I wash the eyeball with a stream of sublimate solution, 1–4,000, and attribute more benefit to the thorough cleansing of the conjunctival surface by water thrown from an irrigator than by the momentary action of the mercurial solution. I consider this more asepsis than antisepsis, and would place as much confidence in a stream of unmedicated water that had recently been sterilized by boiling.

A properly made wire speculum seems to me the ideal method of keeping the lids apart. The instrument should lie flat to the temple, and should make no pressure upon the eyeball. All eye specula by no means carry out these indications. Some use the speculum only to complete the corneal section. I prefer keeping it in place from the beginning to the end of the operation.

I also use the fixation forceps until the lens is extracted. I feel that the eye is safer by so doing. Some use the forceps only to aid in the corneal section, and trust to their control of the patient during the remaining and important steps of liberating the lens. This always seems to me a needless risk. With many patients the eye will involuntarily roll up suddenly at a most inopportune moment, when instruments are within the eye chamber. Unless extreme vigilance and great dexterity is used to anticipate these eye movements, serious injury to the eye will occur. As against this confidence in the patient's ability to keep the eye quiet, I find the judicious use of the fixation forceps a better guarantee against accident.

By nearly universal consent, the corneal wound is made under the upper lid, and is restricted to the clear cornea, although the puncture and counterpuncture are placed in the limbus, where the white sclerotic overlaps the clear cornea. This is done to give width to the opening. The long, narrow, sharp pointed and keen cutting knife of Graefe is in universal use. To do all that is expected of it requires the constant care of a good cutler. In making the section, most surgeons follow the corneal curvature in a line just within the clear corneal boundary. The varied size of the opening through which the lens is to escape without squeezing the angles of the corneal wound, is secured by approaching more or less to the horizontal meridian in the transfixion. This needs experience and judgment to determine in advance, in each case, the size of the lens to be extruded. In making the corneal section some cut with the point of the knife, and then with the heel—a sawing motion. Others complete the entire section by making the point follow the corneal curvature as the blade is pushed forward. These are peculiarities of the operator, and are non essential, provided the knife is dextrously handled, and pressure is not made upon the iris by the blade of the knife in the to and fro movements of sawing. When an iridectomy is to be made, it is now generally agreed that the coloboma should be small. By seizing the iris near the pupillary border with the iris forceps, it is drawn vertically upwards. As soon as the pigmented pupillary edge is seen out of the corneal wound, this protruding portion of the iris is cut off by one snip of the scissors. This gives a comparatively small opening which will not be conspicuous, nor will it permit too much irregular refraction. The method of opening the capsule is still a mooted point. To tear off and take away the anterior surface of the capsule is undoubtedly the ideal method, as it does away with the secondary operations. With an iridectomy and a properly constructed forceps, this can be readily effected. When the iris is left intact, it requires nice manipulation to avoid including the iris in the blade of the forceps. In opening the capsule with the cystotome, much is said of the cutting properties of this diminutive blade, which seldom acts as a knife, but tears the capsule with its sharp point. Provided the rent is made large enough to let the lens out freely, it seems to matter little whether it be in triangular or in T shape. Either of these seems preferable to the horizontal cut over the upper edge of the lens, which leaves the anterior capsule to be disposed of by a secondary capsulotomy some weeks after the extraction. The delivery of the lens is made either by curette pressure on the cornea, or by finger pressure through the lids, the speculum being previously withdrawn. When the patient can be relied upon to direct his eye as the operator desires, no great difficulty presents for finger manipulation. I, with the majority of surgeons, prefer to retain the speculum until the pupil is cleared of all lens substance. I find that when the corneal wound has been made to correspond with the size of the lens to be extracted, the pressure of a shell spoon below the ciliary border tilts the upper edge of the lens forward as well as starts its movement upwards, and delivery is accomplished by following with the spoon the lens as it advances. In the majority of cases, by spoon manipulation on the cornea all lens substance can be removed, even when the iris is left intact. When the lens seems to stick to the inner face of the iris, I have found much benefit in making pressure with the fixation forceps above the corneal wound. Beside keeping the eye quiet, it helps to direct the upper edge of the lens through the corneal opening. To get out fragments of lens which are disposed to remain notwithstanding spoon pressure, I have sometimes used the curette, as is constantly done by Galezowski; or I have washed out the chamber, as is the constant practice of De Wecker. I do not find it necessary to use either of these methods habitu-

ally, as do those surgeons. I have found at times the forceps of great value in recovering fragments of thickened capsule. Recently, in one instance of capsule so thick that the effort of dividing it ruptured the suspensory ligament, I seized the capsule with forceps, and delivered the lens entire in capsule by traction. It was without iridectomy, and gave perfect final results. In another case, equally without iridectomy, with thick capsule which did not yield promptly to the cystotome, I drew out the entire capsule by forceps, and then by pressure removed the lens. There is no doubt but that a very important part of the ideal operation of cataract extraction is to leave the pupil clean of all lens detritus. This should be effected by patient, delicate manipulation, using curette, syringe or forceps, as the indication may demand. When iridectomy has been performed, it is important to have the angle of the corneal wound freed from the presence of any fold of iris, and the spud should be used to dislodge any portion of this membrane which may have been caught in the lips of the wound. When no iridectomy is done, in the majority of cases, after pupil cleansing, the iris resumes its normal position with round central pupil. Should the pupil be irregular, or the iris tend to prolapse, it should be replaced *in situ* by smoothing it out with the side of the spud, using gentle lateral pressure on the face of the iris in the anterior chamber to release any pinching of the iris by the angle of the corneal wound. If the iris be injured in the lens exit, or its tendency to prolapse shows itself, it would be better at once to convert the operation into one with iridectomy, rather than run the risk of an iritic hernia after the final dressing is made. The cleansing of the corneal wound of any blood clot, and the removal of all lens detritus from the conjunctiva, complete the operation. If no iridectomy has been practiced, a drop of an eserine solution, ½ per cent. strength, is placed upon the cornea, otherwise the eye is ready for the permanent dressing. With the closing of the lids after a careful operation, at least nine-tenths of the dangers against a successful result have been already successfully met. In my professional experience it matters little how the eye is dressed, provided the upper lid be kept for a few days over the corneal wound, for its uniform support whilst healing, and provided no irregular pressure be made upon the cut eyeball by badly adjusted compresses, or by too tightly tied bandages. Experience has led me to adopt the lightest of dressing, and the avoidance of dark rooms. I feel also quite assured that we have all erred in inflicting too much bodily restraint, to the annoyance of our patients. To be sure, we get finally good eyes after carefully performed operations, when we keep patients in bed, on their backs in dark rooms; but we equally get good results in like proportion after carefully performed operations, when we do not treat them as bed patients. It is more the careful technique, and not so much the after-treatment, that increases the percentage of cures. I am glad to say that I see a general relaxation from the rigid rules for dark rooms and bed confinement in such universal use a few years back. I am sure that this rational change is for the good of both surgeon and patient.

The ideal extraction of simple senile cataract is undoubtedly without iridectomy, making a flap opening in the upper segment of the clear cornea, destroying, or better, removing the anterior face of the capsule, and getting rid of all lens detritus from the pupil. The operation of extraction without iridectomy is evidently growing in favor. With myself it is decidedly so, as shown by my annual hospital reports. The report of work done at the Presbyterian Eye, Ear and Throat Hospital of Baltimore City for 1887, gives 83 cataract extractions, all with iridectomy. For 1888, 97 extractions of senile cataract, of which 40 were done with iridectomy and 57 without. For the year 1889, of 93 extractions, 33 were with iridectomy and 60 were without. For last year, 1890, of 113 extractions, 93 were without iridectomy, and only 20 with iridectomy. Unless especially contraindicated, all simple senile cataracts are extracted by me without iridectomy. When accidents occur to the iris during the corneal section, or during the escape of the lens, it may be proper to excise a portion. In some cases, when the iris is replaced after the lens has been extracted, it shows a tendency to prolapse, notwithstanding the instillation of eserine. Should such be noted, it is better to remove the protruding portion of iris, and in this way avoid the accidents of iritic hernia during the after-treatment.

PRESSURE ON THE GLOBE AFTER CATARACT EXTRACTION.

Read in the Section on Ophthalmology, at the Forty-second Annual Meeting of the American Medical Association, held at Washington, D. C. May, 1891.

BY EDWARD JACKSON, A.M., M.D.,

PROFESSOR OF DISEASES OF THE EYE IN THE PHILADELPHIA POLYCLINIC, SURGEON TO WILL'S EYE HOSPITAL, ETC.

What is to be said under this head will also apply to all operations involving the section of the cornea or sclero-corneal junction; but is of greatest importance with reference to cataract extraction since it involves the most extensive of these sections.

In the normal eye the contents of the sclero-corneal coat press outward at every point with a force represented by a column of mercury about thirty millimetres in height; and the sclero corneal coat at every point successfully withstands this pressure, by its own continuity and firm

structure. The instant a corneal section is made by the solution in the continuity of the coat its power of resisting outward pressure is annihilated. But as the same section also permits the contents of the globe to freely escape, the outward pressure is annihilated and thus a new and equally perfect equilibrium is established. My plea is that we shall respect this new equilibrium, and not destroy it by excess of external pressure.

At the close of a perfectly satisfactory cataract extraction, the lips of the corneal wound are held by the physical properties of the sclero-corneal coat in perfect apposition; the globe has its normal contour. If there is any deviation from this ideal condition it is always in the direction of deficient contents in the globe and tendency of the cornea to flatten or collapse. And if there be any tendency to gaping of the wound that tendency is due to distortion from sinking in of some other part of the sclero-corneal coat; the necessary manipulations of the globe having pressed out so large a proportion of its contents that the secreting tissues have not had time to replace it. And so long as the corneal section remains pervious, permitting the escape of the aqueous, it is impossible that the pressure in the anterior chamber should become excessive and cause any bulging of the section and adjoining tissue.

When, however, the lips of the wound have become adherent throughout their length; so that all escape of fluid through the wound is checked, and the aqueous is compelled to seek its normal channels, the tension of the globe, the outward pressure of its contents, rapidly rises toward the normal. But as yet the union of the lips of the wound, and the lips themselves, softened by the nutritive changes attending the healing process, are less able to withstand this pressure than the other parts of the sclero corneal coat, and they relatively yield before it in a local bulging. The appearance of this bulging is about the best evidence we have, that the wound has closed throughout its length.

This bulging of the cicatrix reaches its maximum in a very few days after its first appearance, usually within forty-eight hours; and from that time, if the tension of the eye be not sustained notably above the normal, it continues to diminish until it has entirely passed away, under the influence of normal cicatricial contraction of the scar. I have never seen permanent noticeable bulging, unless the iris were incarcerated in the wound, and in simple incarceration without prolapse it may disappear entirely. So much for the natural history of the scar after a cataract extraction. Let us approach the subject from another point of view.

In reporting some cases of glaucomo in which, after other operations, enucleation had been done and the globes subjected to careful study microscopically, before the meeting of the American Ophthalmological Society in 1887, Dr. Wm. F. Norris says: "A study of the cicatrices of these operations (iridectomies and one cataract extraction) shows in each case a displacement of the relative position of the corneal flap and the corneal stump from which it was cut. In each instance the edge of the flap rides up a little, while the cut edge of the proximal portion of the cornea projects deeper into the anterior chamber. In comparing them with the beautiful and careful drawings of Becker in his "Atlas of the Pathological Topography of the Eye," we find that a large majority of his plates, representing flap operations with and without iridectomy, Graefe extractions and iridectomies, show a displacement of the cut edges in a corresponding manner, while two of them give examples of the end of flap being deeper in the anterior chamber, while the proximal edge of the cornea rises slightly above it. In a few instances only, are the inner edges of the incision nearly on the same level." Dr. Norris thinks: "These facts present good anatomical reasons for the utmost diligence on the part of the practitioner to prevent any undue motion of either the body or eyes of the patient after operations, until the wound is sufficiently closed by adherence of the cut surfaces to make it probable that it will not give way or be displaced."

Without questioning the correctness and importance of Dr. Norris' conclusion, it seems to me that the facts to which he draws attention, and his observations can be readily verified by inspection of the photographic reproductions of the appearances in question, give us even more definite indications as to the cause of displacement to be especially guarded against after cataract extraction.

In general the corneal incision in a cataract extraction is not perpendicular to the portion of the cornea through which it passes; but is so inclined that the oblique edge of the flap overlies the corresponding surface of the stump from which it has been cut, in such a way that if the parts are drawn asunder the overlapping will diminish, but if they are thrust together, the over-riding of the flap will be excessive, and only by displacement of very serious extent can the stump be made to over-ride the flap.

When, after the completion of a corneal section the intraocular tension is reduced to zero, the only resistance that is offered to external pressure on the globe is from the elasticity of the coats, tending to reproduce and preserve their normal shape, and this is as great as usual except at the point of incision where it has been for the time entirely destroyed.

Having these facts clearly in mind let us see what is, what necessarily must be, the effect of external pressure on the incised globe.

First, if the pressure be in excess over a limited

portion of the globe its tendency is to push in that part of the scleral or corneal coat, and secondarily there will be a tendency of the neighboring portions of the coat to tilt out. In the uninjured parts of the globe this tendency to tilting out is met and restrained by the inclination of all other parts of the coat to preserve their shape. But with the free edges of flap and stump this restraining influence is removed and a tilting out of the edge may result. Only under such conditions, or by the direct thrusting in of the free edge of the corneal flap, can the overriding of the stump occur.

But even if external pressure be applied to the globe with practical uniformity, its results will be scarcely better. There being no intraocular tension, such pressure is resisted only by the resilience of the walls of the globe, and by those walls is transmitted as by a perfect arch, until it reaches the point at which the arch is broken by the corneal incision. Here the tendency is to force the two lips of the incision together, and the result is just such a displacement of the lips of the wound as has been found to occur in the large majority of such eyes examined, an overriding of the flap upon the stump.

Probably the only reason that would be given for pressure on the globe after cataract extraction, at least by the majority of surgeons, would be that it would aid in securing the fixation and complete rest of the globe. The bandage may aid the fixation of the eye in three ways. By preventing the use of the eyes it removes the chief inducement to turn them from place. But for this purpose it is, of course, essential that both eyes be bandaged. Then the constant contact of a dressing with the lids probably exerts a very important reflex influence, restricting those movements of the eyes that are liable to be made in response to sounds from various directions, or in response to impressions made on other senses. Finally the bandage may, by pressure, mechanically resist the movement of the eye; though I believe it can never altogether prevent it. But the restraint of movement by the application of mechanical force to the globe does the very harm that restraint of movement is hoped to prevent. If, in spite of pressure, movement of the globe occurs beneath the bandage, no matter how evenly it is applied, the area of its application, and points of greatest force must vary with every movement of the globe. Pressure simply becomes a sort of massage. And if massage is to be applied, can it not be more rationally done than by the chance movements of the bandaged globe? It is thus evident that in the first stage of healing, until the wound is quite closed, pressure can only do harm. After the complete closing of the wound there is a distinct tendency to bulging, which pressure might be expected to somewhat counteract if it could be applied steadily to the point of deficient resistance on the part of the coat, and to that point alone. But such use of pressure is manifestly impracticable.

To recapitulate. At the completion of a cataract extraction, or other operations involving a corneal section, an equilibrium without tension is established, while the resiliency of the sclerocorneal coat tends to keep the lips of the incision in the best possible apposition.

That pressure on the globe can only aid in fixing it by doing it mechanical violence, and by the ocular movements is transformed into a species of massage; and whether such pressure be uneven or uniform, it can only tend to cause the relative displacement of the edges of the wound.

Therefore, the primary consideration in the application of a dressing after such an operation is the avoidance of all pressure.

TO WHAT EXTENT ARE PERSONAL RESTRAINTS ESSENTIAL DURING HEALING OF CORNEAL WOUNDS.

Read before the Section of Ophthalmology of the American Medical Association, at its Meeting in Washington, D. C., May, 1891.

BY T. E. MURRELL, M.D.,
OF LITTLE ROCK, ARK.

It is still considered by the majority of ophthalmic surgeons that when the cornea has been extensively incised complete restraint of both eyes, and of the body as well, for some days is essential to safe and perfect healing. This applies to operations on iris or lens requiring opening of the aqueous chamber by a more or less extensive section. Furthermore, in compliance with this opinion, it is considered that such operations should be performed in the room the patient is to occupy in order that as little disturbance of person as possible shall be created. Based upon an individual experience now extending over four year's careful tests and observation, I feel authorized in entering a remonstrance against these iron-bound rules, and take this occasion to offer a plea for greater personal liberties to those subjected to iridectomy or cataract extraction.

It is true, very plausible arguments can be produced in defense of the prevalent custom of bandages, darkened rooms and confinement in bed, but one solitary fact is worth a hundred theories, and experience and observation must always take precedence of abstract reasoning. The restraints ordinarily put upon those who have submitted to an extraction of the lens are often very trying, especially to the aged, the depressing effects of which doubtless often cause tardy healing of the wound. So much do some persons dread confinement in the dark and exclusion of both eyes from sight that under such methods I have sometimes found it very difficult to get the patient's consent

to submit to an operation on the second eye, especially if satisfactory vision has been obtained in the first. But with the very slight restraint I now put upon my patients they regard the operation for cataract and the after treatment as a trivial matter in so far as personal discomfort is concerned.

I had already begun to draw the reins more loosely as regards the points at issue when I became acquainted with Dr. Michell and his methods. I was so impressed with the simplicity as well as philosophy of his dressing and management of his operated cases that I at once adopted his methods, and for a period of four years have used no other.

His statement that he made simple iridectomy an office operation was a surprise to me, but I received it with confidence, and after thorough trial became so convinced of its entire safety that I now no more hesitate to perform an iridectomy in my office, and let the patient walk or ride home than I would to make a paracentesis of the cornea.

Dr. Michell was much more cautious, however, with his extractions, whom he confined to bed a number of days. It occurred to me if the stringent rules I had hitherto followed with my iridectomy cases, which were managed with almost as much caution as an extraction, were unnecessary, then they were likewise, perhaps, to a large extent at least, unnecessary in the latter also. At any rate I determined to make a test of it. I had been in the habit of taking the medical class of our college with me to the room where the patient was to remain, often in distant parts of the city—we then having no satisfactory hospital arrangements—to witness operations for cataract. The next case that applied for relief, I performed the operation in the college building and sent the patient, an old negro man, home, a mile and a half, in an express wagon. The case did as nicely as any I ever had. Encouraged by this I repeated it over and over again with like satisfactory results, leaving to the patients to get home in any manner they could, they sometimes walking a mile or two, always having an attendant. In no instance was there any irregularity in the progress of the cases that I could attribute to this cause.

I had considerable misgivings, however, on one occasion when, during an extraction, a good deal of fluid vitreous was lost. I feared that with only a strip of adhesive plaster over the lids and the patient going more than a mile to his home the balance of the vitreous would run out. But it was not the case. There was no more lost after dressing the eye, healing was by primary union and the result was quite satisfactory.

With such experiences as these, I felt warranted in taking like liberties in my private practice. About this time Dr. Cheatham published a report of cases operated at the medical college and sent home to different parts of the city, all of whom did well.

Dr. Chisolm also made known the fact that he was in the habit of operating in a room downstairs and requiring his patients to walk up-stairs to their room, and that he had seen no harm from it. He furthermore took the initiative in leaving the unoperated eye free, a great pleasure to the patient, and not attended by any bad results. With such corroborative testimony I no longer hesitated to boldly operate in my office on any and all cases that applied, sending them to their homes or boarding houses afterwards. It was with some misgivings that I first tried leaving the unoperated eye open, especially if it had fair vision, on the principle that one eye cannot move without associated movements of the other. Trial of this convinced me in time that it was safe, and I now very rarely close both eyes. Owing to the better facilities to be had in a specially prepared office, and the more readily obtained assistance, besides the greater convenience and saving of time to the surgeon, there is a great gain in performing all operations in ones office. For two years past I have required all my iridectomy and cataract cases, as well as all others, to come to my office for operation, unless, as only occasionally happens, the patient, or family, insists that the operation be done at home. After an iridectomy or extraction only the operated eye is closed by a strip of isinglass plaster, and the patient is sent home in a carriage, or in a street car, or if not very far is allowed to walk home, being always accompanied by another person. He is instructed when he gets home to lie down or sit up as he may prefer, but to keep quiet, and to remain in his room, and not to use the unobscured eye except for some particular necessity, that is, he is not to attempt to read or use it unduly. I find but little disposition on the part of most persons to abuse these privileges.

It will occasionally happen, however, that they do, just as unruly patients will sometimes tear off the bandages.

I made an extraction in my office last winter on an old lady and sent her home, leaving the unoperated eye, which had quite good vision, free and with which she saw her way home. When I called to see her the next day she was not in her room but was in another part of the house quite busy about her domestic duties. She informed me she had been thus engaged from the time she got home from my office and was innocent of there being any harm in it. I at once enjoined her not to attempt the like again, and to remain in her room. Fortunately no harm came from her indiscretion. While such imprudence might lead to dire results, at the same time several similar instances have taught me that there is a great deal of unnecessary fear of

any and all personal liberties after important operations on the eye, that for cataract in particular.

The great secret, in my opinion, lies in a well performed operation in a properly selected case, then closing the lids naturally over the globe and retaining them there by the simplest means, and molesting the eye as little as possible until union of the corneal section has taken place and all will have been done that it is in the power of the surgeon to do to aid Nature in her efforts at repair. As to confinement in bed, the exclusion of light, closely confining both eyes, and any and all personal restraints that bring discomfort, they play no important part in the final results and are both cruel to the patient and useless.

While allowing my patients these greater liberties and additional comforts I have at the same time seen no unsatisfactory results that could in any way be attributed to them.

In fact I have had fewer complications after extraction since doing them in my office than ever before in my experience.

I feel confident that a fair and reasonable trial of the methods I have here described will convince any one that they are not only safe, but that he will be greatly pleased with the convenience and satisfaction they will afford him, while he will have added the gratitude and appreciation of his patients for converting such hitherto formidable operations into seemingly simple ones.

REMARKS ON THE NEED OF MORE EFFICIENT PROTECTION OF THE EYE AFTER CATARACT EXTRACTION, AND AN IMPROVED APPARATUS FOR THE PURPOSE.

Read in the Section of Ophthalmology, at the Forty-second Annual Meeting of the American Medical Association, held at Washington, D. C., May 5-8, 1891.

BY G. E. FROTHINGHAM, M.D.,
OF DETROIT, MICH.

Perfect coaptation and support of the corneal flaps, freedom from any form of pressure that may cause gaping of the lips, or reopening of the wound, and perfect rest of the eye, are the objects mainly in view in adopting any form of dressing after the extraction of cataract. That any imperfect coaptation, or motion of the lips of the wound will interfere with its speedy and perfect union, and, that every reopening of the wound retards recovery and subjects the eye to dangers from infection and inflammatory reaction, are propositions so axiomatic that no one will dispute them. They seem to be universally received principles, though in practice we hardly take the precautions we ought to observe in order to secure our patients against these sources of danger. Mackenzie in his chapter on the after-treatment of extraction, writes as follows:

"A careful assistant or experienced nurse, sitting constantly by the bedside for the first forty-eight hours, and for several succeeding nights, ought to attentively watch the patient when he wakes, and taking care especially, that he does not turn round suddenly upon the eye which has been cut or put up his hand to rub it. If there is any particular reason to dread the latter accident, it may be proper to muffle the patient's hands and pin them down by his sides.

"The length of time during which the patient is to be kept in bed, is a point upon which there has been a wide diversity of practice. It would appear that Wenzel was at one time in the habit of confining his patients to their backs, without change of posture for a fortnight or three weeks, but that afterwards he shortened the period of confinement to eight or ten days. Mr. Phipps, on the other hand, examined the eyes on the morning after the operation, applied a shade and allowed the patient to rise.[1] A middle course appears to be the most judicious. The incision may be looked at the third day. On the fourth day the patient may be allowed to sit up for a short time. On the fifth the eye may be fairly examined, but immediately afterward covered with a shade. In eight or ten days the patient may be allowed to look at large objects and look about the room."[2]

Lawrence says: "The coverings of the eye should be light; a soft rag doubled and wetted in water, may be gently bound on the eye by a single narrow linen band, and the other may be covered in the same way. Recollect that the eye is naturally open to the air, and that a sound eye would be heated and rendered uneasy if it were bandaged up.

"The method followed by Beer and most of the German operators, of closing the lids by a strip of sticking plaster carried from the forehead to the cheek seems to me most objectionable.

"We must not, therefore, regard it as a rule, that the patient is to be bandaged. The light covering I have recommended is rather employed to keep the eye quiet, and guard it from any slight accident, than as a measure absolutely necessary; on the latter account it is proper to have the eye covered during the night, but it may be left open, or at least with thin wet rags only on it when the patient is awake."[3]

This open method of treatment seems to have been quite common until von Graefe advocated the use of the pressure bandage in connection

[1] On the Treatment of Patients after the Operation of Cataract, by Jonathan Wathel Phipps. London. 1792.
[2] Diseases of the Eye, by William Mackenzie, Edition of 1833. Boston, Carter, Hendee & Co.
[3] A Treatise on the Disease of the Eye, by W. Lawrence, F.R.S. London, 1833. Pp. 425 and 426.

with the operation he devised, and which soon became so general.

We are to day debating the same questions that divided the colleagues of Lawrence and Mackenzie. While we do not direct that a faithful assistant or nurse watch continuously by the bedside for two whole days and several succeding nights to see that no injury is inflicted upon the eye, we may sometimes wish we had.

As it was more than a century ago with the followers of Wenzel and Phipps, so to day we have practically two methods of dressing the eye after cataract extraction.

By one method the lids are kept closed by the application of a cushion of absorbent cotton, charpie, or common cotton, held in place by a protective bandage. This may be applied lightly according to the directions of Stellwag and other writers, or with quite firm pressure, as advised by Graefe, and still preferred by some.

By the other method of dressing the lids are held together by strips of adhesive plaster, the eye being otherwise left free from covering or pressure. This is what is now known as the open method, and is advocated by several members of this Section.

I think it will be conceded that each of these methods has some advantage which the other does not offer, and also that neither fulfils all the indications that we attempt to meet by the dressings we adopt after an extraction.

I think it will also be quite generally admitted that the closed lid, with no artificial pressure, constitutes the best and safest splint for holding the lips of the wound in coaptation after the operation, and that the closing of the lids of both eyes conduces to that perfect rest of the operated eye essential to its greatest safety.

There are many who believe it nearly, if not quite, impossible to apply a bandage with that firmness necessary to maintain its position, without exercising unequal pressure upon the eyeball, sufficient, at times, to interfere with speedy healing of the wound and reëstablishment of the anterior chamber. If the bandage should happen to slip in any way, either from below upward, from above downwards, or from side to side, this unequal pressure is almost sure to be produced, and such accident is not unfrequently the evident cause of reopening of the wound. The method of dressing the eye with large pads of cotton and a pressure bandage has been retained partly with a view of protecting the eye from slight blows, which might prove more harmful in the open method of dressing. That the pad and bandage, though it affords some protection from slight blows, can offer no sufficient resistance to severe blows, is too evident to need discussion.

It has always been my custom to apply with great care the usual pad and bandage, to guard against its slipping by a second bandage of thin material applied by several turns outside of the first bandage, and passing under the chin and over the vertex, and finally fastening the two securely together, so as to prevent any motion of that part of the original bandage which covers the eyes. To guard against blows I have impressed the assistants with the necessity of great caution in their manipulation, and during sleep have had the patients hands so secured, that while a certain degree of motion was allowed, there was no possibility of getting them up to the eye so as to rub or strike it.

Notwithstanding these precautions several accidents have happened that have impressed me with the need of more efficient means of protection than are in common use, and with the necessity of having such appliance cause so little annoyance to the patient, that they may be willingly tolerated until the wound has had time to become very firmly healed.

A brief account of a few accidents that have happened to my patients will serve to illustrate the nature and extent of the danger against which we ought to provide better protection.

Case 1.—A lady of 55 was operated upon by me for cataract of the left eye, by the old method of simple extraction with Beer's knife. Operation smooth. On the third day the eye was opened. The anterior chamber was restored, the pupil was clear and central, and vision seemed good. On the fourth and fifth days the eye was examined and showed no sign of complication. On the morning of the sixth day, after the eye had been dressed, she suddenly pitched her head forward with considerable force, and struck the operated eye against a chair post. The wound was reopened, the iris prolapsed, and the anterior chamber filled with blood. Although the prolapsed iris was excised and proper care instituted, inflammatory reaction resulted, a secondary operation became necessary and ultimate vision was only $\frac{1}{200}$, where a perfect result seemed almost certain before the accident.

Case 2.—A man, æt. 54, was operated upon for hard cataract of the left eye by Graefe's modified linear operation. The operation was smooth, and the eye was dressed in the usual way with a pad and bandage, and at night the hands were firmly secured to prevent his rubbing or striking the eye while asleep. On the fourth day the eye was examined. The wound was closed, pupil clear, and the eye free from inflammatory or other complications. On the 5th, the eye was dressed and examined, and everything was progressing favorably. On the fifth night the patient had his hands left free without authority. Toward morning the patient was awakened from his sleep by a severe blow upon the operated eye, which he had inflicted upon himself by bringing his hand violently against it. The pain was so severe that I was sent for and visited him at an

early hour. The wound was torn open and the anterior chamber was filled with blood, a clot of which protruded between the lips of the corneal incision. The blood was evacuated as completely as practicable, and the eye carefully dressed. Iritis supervened. A quite thick membrane formed in the pupil, and a secondary operation became necessary. The ultimate vision, fortunately, was good, being $\frac{20}{30}$.

Case 3.—A man, æt. 75, was operated upon by Graefe's method for extraction of cataract of right eye. The operation was smooth and the eye dressed as usual with pad and bandage and hands secured during sleep. On the fourth day the eye was examined. The wound had united, the pupil was clear and the eye free from redness. On the fourth night the patient turned suddenly on his face, struck his eye forcibly against the pillow, causing great pain. On examination of the eye it was found that the wound had been opened, the anterior chamber was found empty, and the dressings found wet and slightly stained with blood. Dressings were re-applied, and extreme caution urged against further injuries. On the sixth day the wound, which had again united sufficiently to hold the aqueous and restore the anterior chamber, was broken open by the patient while awake. He was sitting in a chair, and, in a state of reverie, suddenly brought his hand to his face, striking his eye with such force as to again re-open the wound. The pain caused by the blow was so intense at first, and the effect of the injury was so great that he nearly fainted. Again the wound united, but with a reddened condition of the eye, and an aggravation of the tenderness, which had existed, to a slight degree, ever since the first blow. On the third day after the second injury, although the attendant tried to watch the patient with great care, he struck the eye again with his hand in a manner similar to that which had caused the second injury, and for the third time re-opening the wound. As a result, a low form of iridocyclitis followed, retarding recovery and ultimately leading to detachment of the retina. The latter result would not have followed, probably, had the patient not wilfully disobeyed instructions and used his eye sooner than he ought to have done under the circumstances.

These are the extreme cases that have occurred in my practice, and I presume that like cases have occurred to most operators, and that slight injuries have quite frequently occurred. They demonstrate that the ordinary pad of cotton and bandage afford but little if any more protection against severe blows, than the open method. Neither can such accidents be guarded against by pinioning the hands of the patient by the side, since he may suddenly turn, as did my patient, upon his face, and produce the injury. Nor can the "careful assistant or trained nurse," recommended by Mackenzie and others, prevent them, unless they keep their hands constantly upon the arms of the patient. If they fail to do this, the movement of the patient may be so sudden and rapid that the injury will be done before an attendant can catch and restrain him. Pinioning the hands of the patient becomes so irksome that few will tolerate it and they will loosen their hands and get their attendants to omit the precaution after enduring it for one or two nights.

It would seem that the attention of the profession has not been turned to this subject as much as its importance really demands, for though only an occasional loss of an eye may follow from these injuries, to guard against *any* loss is the object of the prudent practitioner.

Within the last few months two communications on this subject have been made to the profession. The first of these was by Dr. H. Gifford, of Omaha, and appeared in the *Archives of Ophthalmology*, Vol. 19, p. 42. Dr. Gifford proposes to cover both of the eyes with "concave shields of stiff pasteboard, of such shape that the flaring edges may rest upon the bridge of the nose, the forehead and the cheek, while the arched centre is an inch or more from the eyeball. This is kept in place by an elastic band, but over all, to secure firmness, a monocular roller bandage covers that shield which is placed over the operated eye. Dr. Gifford's shield is easily made, and when firmly and securely applied, must offer quite complete protection from the kind of accidents I have mentioned, unless the shield should happen to slip from its place. In that case its edges very likely would take such a direction that one of them would press upon the eyeball. Under this shield the lids may be closed by adhesive plaster, or confined with the ordinary pad and bandage.

The objection to this shield is, that it is even more impervious and heating to the eye than the ordinary bandage, and this is a sufficient consideration to lead some operators to reject it altogether. To remove this objection Dr. J. S. Prout,[4] of Brooklyn, has proposed a wire mask, made of wire netting such as is used for window screens, and fastened about the head by means of two tapes.

In remedying one defect and offering a covering which is light and cool, he proposed a form of dressing which evidently must be unsafe on two accounts. In the first place, it can hardly be held securely in place by the fastenings he proposes. Secondly, and mainly, it is, and must be, inefficient, by reason of the lack of stiffness, as a protection against the severe blows that are sometimes accidently received by the operated eye, and against which Dr. Gifford's shield does offer protection. Again, an ordinary wire

[4] The American Journal of Ophthalmology, January, 1891, p. 1.

netting cannot, even when sufficiently firm, be properly arched by any process to remain as a permanent firm concave surface, an inch or so removed from the surface of the lids. A consideration of the desirability of a dressing that, while cool and allowing free access of air to the eye, yet would be firm enough to resist severe blows, and so secured as to remain in place when applied to the most restless and unruly patients, led me to devise the mask which I here present. This mask is woven by a skilled wire worker, after a pattern which I furnished. By its construction the arch is so firm that a powerful blow cannot indent it, so as to allow of pressure upon the eyeball over which it is applied. It is open and cool. It is fastened in such a way that the tapes cannot slip over the vertex of the head or in any other direction, and allow the mask to become displaced. It is so formed, that should it become displaced, the edges would not strike against the lids, but be carried away from the eyeball. It can be used over any form of dressing. The open method may be followed and the patient allowed to use the unoperated eye if his attendant so desires, or it can be applied over a light pad of cotton, or the pad and bandage both, as the operator may choose.

While by no means perfect, I present it for the consideration of the Section, believing it to be the coolest and the most efficient of any dressing I have seen proposed, for protecting the eye from mechanical injury after extraction of the cataract, or while undergoing treatment for wounds of the eyeball, that might be re-opened by accidental blows or pressure.

DISCUSSION ON CATARACT.

DR. F. C. HOTZ, speaking of the management of cataract cases after the operation, said that whatever different views we might have on this point, we certainly all admit that the final success does not solely depend on a skilful operation, but also on the quick and smooth healing of the wound, and that therefore we are anxious to attain a speedy union of the wound. The necessary condition for first union of any wound is the accurate and undisturbed coaptation of its edges; and all our care and dressings after an operation must have this end in view, to wit: to protect the nicely apposed edges of the wound against any sudden or repeated disturbance. This end can be attained only if we keep *both* eyes closed until the edges of the wound are united. When the operated eye alone is closed, it is of course compelled, by the law of associated muscular action, to follow all the rotations of the other eye. These movements in the act of seeing are quick, and almost incessant; every such movement means a sudden tension upon the sclera by quick muscular contraction; and if the portion of the sclera thus acted on lies in the line of the operation (as it does in up and down rotations), this sudden muscular tension will necessarily pull the edges of the wound apart. That this does actually occur, is shown by the sharp pain most patients experience, and the discharge of the aqueous humor we can see, when such rotations are made a short time after the operation.

Another factor likewise disturbing the rest and coaptation of the wound edges, is the winking. Every time the seeing eye winks, the orbicularis of the closed eye acts in association with its fellow, and makes a sudden pressure through the eyelid upon the globe. Dr. Jackson has just shown us how any sudden pressure upon the cornea, after an operation, will displace the wound edges; and the great discomfort patients experience under these circumstances, confirms it.

Now as to the materials used for dressing, I prefer the absorbent cotton and roller bandage of mosquito netting to the plaster or any other dressing. The cotton, carefully adjusted, forms an elastic cushion which readily adapts itself to the uneven surface of the eyelids. The roller is applied wet, and when the several layers get dry, they are so firmly pasted together that the bandage cannot get out of order; turning the head on the pillow does not affect it, and consequently the cotton under it remains absolutely undisturbed, and you will find it so when you remove the bandage on the second or third day. The object of the bandage is to keep the eyelids closed gently, just as in sleep; its object is not and cannot be to render the eyeball immobile. It is neither necessary nor could it be done by any degree of pressure; and any bandage which presses is objectionable.

Plaster strips I found very unsatisfactory; they would get loosened by the tears and separated from the lower lid, either altogether, or at least so much as to allow a partial opening of the eye; or they became so dry and hard that their stiffness made the patients very uncomfortable; they begged me to take them off. I was therefore much interested in seeing the working of these plaster strips in the hands of the most enthusiastic advocates of Michel's method. A visit yesterday to the Presbyterian Eye and Ear Infirmary in Baltimore, showed me that bandages were not altogether discarded (as we were led to believe), and that eyes would get as red and irritable under the plaster as I have ever seen them under the bandage.

And this is another untenable charge made against the bandage by the friends of Dr. Michel's method: that the bandages cause redness and photophobia. It is not the bandage or any other kind of dressing that does it, but it is the different degree of sensitiveness with which different eyes respond to an operation. While one eye opens up fully and shows no redness when the first bandage is taken off, on the second or third day,

another eye shows a moderate injection, and a third one shows a great deal of it, although the operation in all cases was alike. And while one eye may go without any dressing after the third day, I have seen eyes which required a bandage for several weeks, because when it was left off the eye became red, watery and painful, and all these symptoms disappeared as soon as the bandage was reapplied. Mr. Chairman, our forefathers in ophthalmic surgery may have been over-cautious, and enforced restraints (like absolute confinement to dark room and bed) which are unnecessary; but when we hear people talk as though an eye after an operation required no care, I believe it is time to call a halt to this tendency of going to the opposite extreme. Though I do not doubt that eyes may get well under this loose management, I insist that there are certain indications which must not be neglected, if we wish to call our management a careful and rational one.

DR. J. L. THOMPSON: As to the causation of non traumatic cataract, many interesting points present themselves. Heredity seems to have a marked influence. I have seen families apparently in robust health, where father or mother has been reported cataractors at a certain age, and where several of the sons and daughters have been operated on for same complaint, where no point of departure from health has been recognized even after careful examination of urine and other suggestive examinations has been made. My records, running over nineteen years, are very full of pencil sketches of incipient cataract. Often have I examined patients for anomalies of refraction, or other eye affection, where no trace whatever of lenticular opacity has been seen, and again in a year or two I have found the periphery or the nucleus slightly clouded. In some of these (the peripheral variety) both lens have been ready for operation in six months, others not in as many years, while others have not changed one particle after the lapse of sixteen years; especially is this the case where the opacity is at the lower inner periphery of the lens. Indeed I have seen hundreds of cases of opacity of this part of the lens which have never advanced after the first deposit or cloudiness.

Why is it that opacity of the lens takes place so often at the lower inner portion? Has gravitation, or lid pressure, or convergence, or efforts of accommodation any thing to do with these phenomena? Another symptom which has frequently arrested my attention while watching the progress of cataract is, congestion of the fundus manifested by floating bodies in the vitreous, and when we have the opportunity of watching these cases to the end often do we see the change from high degrees of hyperopia to the myopic condition. And here we often see the "second sight" of the elderly, again watch these cases until after the opacity is greater, and the case is almost ready for an operation and the patient can hardly see to go about, when he calls upon us with a beaming countenance, seeing better than for years, the lens having fallen below the pupil. And again, to further astonish me, in one of my patients whom I had watched for years, and in whom I made a preliminary iridectomy five years before owing to a trembling lens, a more remarkable occurrence took place. Not having seen him for several years, he reported one day with the lens substance clear, and nothing but a little dotted capsule left. This occurred several years ago, and he now drives out and does his business with ordinary cataract glasses. So we cannot say cataract is incurable short of operative means. As to bandages, I cannot speak positively. Dr. Knapp, who is extremely careful to bandage his eyes after cataract operation, loses only one case in a hundred, while Dr. Chisolm, who discards bandages, gets about the same result. I think, however, a Providence favors Dr. Chisolm that would not me, for surely a Nemesis would overshadow me were I to try it. Since visiting Dr. Chisolm's Infirmary, a year and a half ago, I have used adhesive strips. I was surprised while there to see the freedom he allowed his cataract patients who were wallowing around on the beds and everywhere.

DR. P. D. KEYSER: There is now no doubt that the choicest and best operation for the extraction of cataract is that without iridectomy, but at the same time it cannot be made in every case. There is one condition in which I invariably make an iridectomy, and that is where the iris fails to respond promptly to light, or reacts sluggishly to atropia. In such cases I have invariably found iritis to follow the simple operation. There are many cases in which it is necessary to make an iridectomy twenty-four or thirty-six hours after the extraction on account of prolapse of the iris. In case of prolapse soon after the operation, iridectomy should not be made at once, for by instilling a drop of eserine solution in the eye every five or ten minutes for a half to one hour, the iris will sometimes be drawn in and the operation avoided. I have found washing out the anterior by means of Wecker's syringe, will remove much of any soft cortical matter remaining behind. In some cases I introduce the nozzle under the iris and wash out behind the iris. Where no iridectomy is made I follow Wecker in using a weak solution of eserine and boric acid in the syringe. The opening of the capsule is a particular point, especially where the iris is not cut. The instruments recommended for removing a piece of the capsule are apt to catch the iris and draw it out without extreme care. I find it impossible to cut a triangular piece out with the cystotome.

When the capsule is slit once the cystotome will not cut across it, but instead it is rolled or dragged back, and in a day or two falls back and closes the opening, requiring a second operation. My best success has been in passing the cystotome through the corneal incision and cutting the capsule across as near the upper periphery under the iris as possible; then turning the instrument with the fleam on the flat, and passing it under the iris opposite the first cut, the point of the fleam is turned downwards, and a straight cut made towards the centre of the first cut, at right angles to it, like an inverted T.

As to bandages, I believe that both eyes should be kept perfectly quiet for twenty-four hours by bandages, and the patient kept in bed for that length of time. I apply a little cotton on the eyes, and a Liebreich bandage for the first day; on the second day I let the unoperated eye out and the patient up. Plasters I do not like, as they are liable to come loose where court plaster is used, or to be painful on removing if adhesive plaster is used, and to cause a spasm of the facial muscles and pressure on the eye, with possibly, opening of the corneal wound. The bandage should be light and merely sufficient to hold the lids in normal apposition.

DR. EUGENE SMITH: "Why do we in simple extraction so often get prolapse?" He attributes it to tilting the knife forward in finishing the section, the upper part of the wound remains open and the aqueous leaks out for some time; but if the section is finished without tilting the knife forward so as to make a flap, the wound more readily closes, and there is less danger of prolapse of the iris. Leaves the mode of dressing to each one's experience. He thinks a little absorbent cotton on the eye held in place by strips of adhesive plaster from the forehead to the cheek very good, but prefers the bandage.

In opening the capsule, the tearing out of the central portion as first suggested by Græfe is difficult with any instrument hitherto constructed. He, however, had devised a forceps for removing a piece of the capsule which worked very nicely. It is like an ordinary iris forceps with the teeth on the lower side, quite long and projecting and extending some distance from the point.

DR. CHISOLM said he made an extraction without iridectomy about a week ago and the corneal wound had not yet healed. The cornea remained perfectly clear and there was no inflammatory reaction whatever about the eye. As to his methods he was only gratified with his present results compared with his former under the old methods.

DR. AYERS now uses adhesive strips exclusively in dressing the eye after extraction. He thinks much depends on their careful application. He is careful that the strips are not long enough to pass beyond the width of the lids. In this all traction by adjacent muscles, especially of the orbiculous, is obviated.

The extraction is made without the use of a speculum, the assistant holding the lids open with his fingers. The decision of the capsule is made before the lids are closed. The lids are then closed for a moment, after opening the eye and directing the patient to turn his eye down, pressure with the point of the index finger, or with the curette until the lens presents itself and is completely delivered.

DR. DUDLEY S. REYNOLDS said: I agree with those who are particular to secure a section with beveled edges to favor coaptation in the wound. I am anxious to add my endorsement of the lightest possible dressing without bandage, not to be removed or in any way disturbed for four or five days, unless evidences of irritation occur. As to prolapse of the iris, I have to say it may nearly always be prevented by the free use of eserine in solution before closing the eye.

I would not regard iridectomy as justifiable, excepting as stated by Prof. Keyser, where iritis has been present.

DR. SAVAGE: There are, to my mind, two indications for iridectomy in cataract operations. To one of these Dr. Keyser has already referred, viz.: when the pupil will not dilate. The other indication is when the cornea is flabby. In this condition, my experience teaches me that if an iridectomy is not done, there will be prolapse in spite of eserine.

DR. RANDALL wished to add his testimony to the importance of treating with alteratives the cases of incipient cataract, as he had seen many cases of prompt cessation of all advance in the cataractous process, which had before seemed rapidly progressive. Opacities are generally first and most markedly seen down and in, because this is the worst part of the choroid, being the most exposed to excess of light. These have not seemed any less apt to advance than spicules in other parts of the lens. The media have become clearer and so remained, and there has been generally little increase of the swelling of the lens, which has at times been previously marked.

DR. MINNEY: In his experience, a fluid vitreous is also an indication for iridectomy, in addition to the one mentioned by Dr. Keyser, of iritis, and the flabby cornea alluded to by Dr. Savage.

BOGUS MEDICAL DIPLOMAS.—The Wisconsin State Medical Board says the Northwest is being flooded with fraudulent medical diplomas, purporting to be issued by the University of Victoria, at Montreal. Fifty of these diplomas have been found in Wisconsin and South Dakota.

THE REFORMED NUMERATION OF PRISMS AND THE CENTRAD AS THE UNIT.

Read in the Section of Ophthalmology, at the Forty-second Annual Meeting of the American Medical Association, held at Washington, D. C., May, 1891.

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About twenty years ago was inaugurated the reform in the numbering of ophthalmological lenses upon the basis of their actual strength as determined by their focal length. Before that time lenses were generally taken at a face value, which represented, in such diverse units of length as were locally employed, the radius of curvature to which each was ground. The reform met opposition on the ground that lenses had to be made by grinding to surfaces of given radii, that the radii gave a sufficiently accurate indication of the focal strength, that there would be large financial loss in abandoning the old system and adopting the new, with its less familiar units—in short, that the change, even if theoretically desirable, involved more practical difficulty than actual advantage. Yet the positive advantages of the reformed system, arising in part from its metric character, but also largely from its acknowledged accuracy of basis, carried it in the face of all opposition; and its acceptance is now nearly universal. It was clearly essential that we should consider lenses from the side of the user, not of the maker; and that we should call for lenses of given strength, and leave to the optician the matter of the refractive index of his material and the radii to which he should grind it. Doubtless lenses were long ground upon old inch moulds, but these have now been trued to metric accuracy or else replaced; and aside from that, it is doubtful if any of the opticians would now elect to go back to the older system.

As with lenses, so too with prisms, the same principle holds good; and it is to be regretted that it was not seen at the time, that their numeration stood in need of the same reform. We use prisms to measure or correct deviations of the optic axes, because they have the property of bending the rays of light passing through them. We employ them to obtain a certain effect—a deviation of the rays of light—and are wholly unconcerned as to how that deviation is secured. In the past we accepted prisms as furnished by the optician, and numbered in accordance with the angle between the two faces—this being the basis upon which they were more or less accurately ground. Only the few took into consideration the actual strength; and these were satisfied with the fact that the deviation produced approximated the half of the refracting angle, just as the radius of curvature gave an approximation to the strength of a lens. Yet this relation is far from constant for prisms of varying strength, even if accurately ground and of identical material; and in practice the oculist generally depended upon the method of neutralization by means of the prisms of his test-case. Yet, convenient as that method is and will always be, it leaves one entirely at the mercy of the numerous errors which Dr. Jackson has shown to be so common in the test-sets; and we must have, as the basis of our system of prism numbering, a method of exactly measuring the effect—the deviating power—of each prism.

Such a system was proposed by Dr. Edward Jackson, to whom belongs the honor of instituting the reform and demonstrating its necessity. He proposed that prisms be numbered according to the actual deviation in degrees which they cause in a ray of light passing through in the position of minimum deviation. Just as a lens has a varying strength when it is tilted, so has a prism one position—that when the entering and emerging rays make equal angles with its faces—where its deflection is at its least—to increase with any tilting in either direction. This, or some other equally definite position, must be accepted as the one in which the deviating effect shall be measured. So placed, a prism causes a definite angular deviation; and the size of this angle measures the exact strength of the prism. The first and cardinal step in the reform is made in considering this angle only, irrespective of the inclination of the prism faces or the refractive index of its material.

The reform is too evidently desirable to need argument in its behalf. It is accurate in principle and in fact, where our old system was gravely faulty. Against it can only be argued that the errors of our present numbering are of small practical importance, and that there are difficulties in introducing the new system. As to the sufficient approximation of the numeration now in vogue, Dr. Jackson has shown that at no point do the prisms in common use accurately give a deviation equal to one-half of the refracting angle, but that, beginning with a value of 0.54° actual deviation for the 1° prism (placed with one face perpendicular to the incident ray), the deviation increases more rapidly than the refracting angle until, at about 40°, they become equal—a 40° prism gives a little more than 40° of deviation. Beyond this, any small increase in the refracting angle gives a much greater deviation, until at 41.48° the "critical angle" is reached, and the deflected ray no longer emerges from the prism. Infinitesimal differences in the index or the refracting angle here greatly change the power of the prism. This condition is less quickly reached when the measurement is made in the position of minimum deviation; and it is only at 81° that deviation and refracting angle become

equal. Yet the fact holds good that the angle between the faces of the prism gives but a variable and indirect suggestion of its deviating strength—two 10° prisms do not equal a 20°, and it would take eight of them to equal a 40° prism. The deviating effect of the prism—the strength which it has to fulfil our uses—furnishes us with the rational basis for our enumeration.

TABLE SHOWING THE VALUE AND RELATIONS OF CENTRADS.

Centrads.	Arc or Angle.	Tangent (P. D.)	Ref. Angle (Index 1.54).
1.	0°.57295 plus	1.	1°.06
2	1°.14590	2.0001	2°.12
3.	1°.71885	3.0013	3°.18
4.	2°.29180	4.0028	4°.23
5.	2°.86475	5.0045	5°.28
6.	3°.43770	6.0063	6°.32
7.	4°.01065	7.0115	7°.35
8.	4°.58360	8.0172	8°.38
9.	5°.15655	9.0244	9°.39
10.	5°.72950	10.033	10°.39
11.	6°.30245	11.044	11°.37
12.	6°.87540	12.057	12°.34
13.	7°.44835	13.074	13°.29
14.	8°.02130	14.092	14°.23
15.	8°.59425	15.114	15°.16
16.	9°.16720	16.138	16°.08
17.	9°.74015	17.164	16°.98
18.	10°.31310	18.196	17°.85
19.	10°.88605	19.230	18°.68
20.	11°.45900	20.270	19°.45
25.	14°.32375	25.55	23°.43
30.	17°.18850	30.934	26°.81
35.	20°.05325	36.50	29°.72
40.	22°.91800	42.28	32°.18
45.	25°.78275	48.30	34°.20
50.	28°.6475	54.514	35°.94
60.	34°.3770	68.43	38°.31
70.	40°.1065	84.22	39°.73
80.	45°.8360	102.96	40°.29
90.	51°.5655	126.01	40°.49
100.	57°.295 plus.	155.75	39°.14

TABLE OF METER ANGLES IN CENTRADS AND PRISM DIOPTRES.

	Inter-ocular distance =50 mm.		Inter-ocular distance =60 mm.		Inter-ocular distance = 64 mm.	
M. Ang.	Centrads P.-D.	Min. D.	Centrads P.-D.	Min. Dev.	Centrads P.-D.	Min. Dev.
1	2.5004	2.502	3.000	3.0012	3.2006	3.2017
2	5.003	5.008	6.004	6.010	6.404	6.413
3	7.509	7.519	. . . . .	. . . . .	9.61	9.644
4	10.020	10.059	. . . . .	. . . . .	12.83	12.096
5	12.535	12.603	15.05	15.17	16.06	16.208
6	15.06	15.18	. . . . .	. . . . .	20.39	20.97
7	17.19	17.77	. . . . .	. . . . .	25.88	26.48
8	20.20	20.41	. . . . .	. . . . .	29.21	30.07
9	22.69	23.09	. . . . .	. . . . .	32.55	33.77
10	25.74	26.81	30.47	31.45	39.41	40.64
12	30.09	30.97	. . . . .	. . . . .	46.45	50.12
14	35.76	37.36	. . . . .	. . . . .	53.73	59.60
16	41.15	43.65	. . . . .	. . . . .	61.38	70.38
18	46.68	50.05	. . . . .	. . . . .	69.45	83.29
20	52.36	57.75	64.35	75.0		

Our designation of prisms by the amount of deviation brings in the need of a new nomenclature. "Degrees" of prism have always in the past expressed the size of the refracting angle—"actual deviation" must now be expressed if we use degrees to indicate the *strength* instead of the *shape*, and the position of the prism must be specified. Accordingly, Dr. Jackson proposed that we measure in the position of minimum deviation, and add a small *d* to the number to indicate this. The system has advantages, and is upheld by Landolt as the best; yet the minimum deviation is not very convenient to measure precisely, such a mounting of our prisms would be inconvenient in our test-frames, and all computations are simpler if the entire refraction takes place at one surface. There would be inevitable confusion, also, between the old system and the new, since both use "degrees," yet mean very different things by that term.

The second step, suggested by Dr. Wm. S. Dennett, was very important, therefore, since it removed these difficulties. He proposed as a working unit a prism deflecting (through an angle subtended by an arc 0.01 the length of the radius) the ray of light falling perpendicular to one of its faces. This is the "centrad." The mathematicians, in seeking a better unit of arc and angle than the degree, have adopted the "radian"—an arc equal to the radius—and .01 of this is the "centiradian" which subtends the centrad. The new unit is distinct in name, in accord with advanced mathematics, and also—very important for its practical adoption—it is almost precisely the strength which we ought to obtain from a prism of 1° refracting angle. If made of light flint glass instead of the usual crown glass, the equivalence would be exact for the smaller numbers, and the symbol Cr. instead of Pr. will be the only difference to mark the use of actual values in the place of the nominal.

A further step in commending the reformed system was made by Mr. Chas F. Prentice, in advocating a similar unit. His "prism-dioptre" deviates the ray of light through one one-hundredth of the radius as measured on the tangent instead of the arc, and for low values is identical with the centrad in strength. He has shown that, within narrow limits, it has relations at once simple and of great importance to the valuable "meter-angle" and to the decentering of lenses. In any given case one-half the inter-ocular distance in centimeters closely approximates "prism dioptres" or centrads the value of one meter-angle. Thus for inter-ocular width of 50 mm. the meter-angle is equal to 2.50 P-D. or Cr. Yet the relation can be but an approximation, since one-half the inter-pupillary distance equals the sine of the meter-angle, not the angle itself; while the "prism-dioptre," being a tangent measure can represent neither precisely, and within practical limits the discrepancy is considerable. Thus for 7 cm. between the eyes, 5 M.a. equals 17.76 P D. instead of 17.5. Ten M.a. would be 37.36 and 20 M.a. 98 P-D. instead of 35 and 70, respectively. Conversely 35 P-D. would represent 9.45 M.a., not 10. The centrad values are distinctly more close an approximation. For 7 cm. between the eyes 10 M.a. equals 35.74 Cr. instead of the even 35; and 20 M.a. equals 77.88 Cr. It must not be forgotton, however, that in this later case 35.74 and 77.88 are the accurate expressions in "radian" or "arcual" nomenclature of the values of

10 and 20 M.a. respectively—the discrepancy is here due to the inaccuracy of the convenient assumption that the meter-angle is *directly* expressed by the inter-ocular distance.

Mr. Prentice has also pointed out that in the decentering of lenses, the dioptre-strength of the lens multiplied into the centimeters of decentering gives the prismatic effect in "prism-dioptres." This is theoretically accurate, except for spherical aberration—in fact a 20 D. lens decentered 1 cm. (an extreme case, practically) gives 20 Cr. or 20.27 P·D. of deviation.

Such then are the main points in favor of the reformed numeration of prisms: the question is then as to which is the best of the systems proposed, or whether a further improvement can be made. Of the two simplest positions of the prism that in which all refraction takes place at one surface seems the more practical and simple, although the minimum deviation is easier to measure off-hand and permits the use of a wider series of prisms. An instrument of precision to measure the minimum deviation could be easily constructed and graduated to read in degrees or centiradians or tangent-centimeters. The prism-dioptre may be slightly easier to measure, since any wall laid off in even centimeters forms a ready prismometer. Yet the centrad is as easily and accurately measured by improvised or special apparatus, is in full accord with our received methods of noting deviation in terms of arc or angle, is more directly comparable and convertible, and finally, gives the closest approximation in the direct determination of the meter-angle and the prismatic effect of decentered lenses.

THE PRISM-DIOPTRY VS. THE CENTRAD.

Read in the Section of Ophthalmology, at the Forty-second Annual Meeting of the American Medical Association, held at Washington, D. C., May, 1891.

BY SWAN M. BURNETT, M.D., PH.D.,
OF WASHINGTON, D. C.

I have had occasion to remark before, in respect to this question, that what we need in the nomenclature of prisms is scientific accuracy, readiness and simplicity of practical application with as little innovation in established custom as possible. The prism-dioptry, I believe, fulfills all these requirements. It takes as a standard prism one which causes a deflection of 1 cm. on a plane at one meter's distance, which is nearly what is now known as a one degree prism, and will thus entail no change in the present process of manufacture or in the plant of the manufacturers. It is scientific and accurate, every prism being precisely what its number indicates, and its power can be measured by any one having a centimeter rule and a meter measure. No complicated apparatus is necessary, though for the finer determinations and for certain combinations of sphero-and cylindro-prisms the elegant instrument of Mr. Prentice is essential. It brings itself into harmony with the so-called meter angle and enables us to estimate the amount and power of convergence by a simple measurement of the inter-pupillary distance with an accuracy that is sufficient for all practical purposes, and, by the same or less amount of calculation than is necessary with the centrad or the present system, with perfect accuracy. It enables us to find the prismatic action of decentered spherical and cylindrical lenses with great exactness and with remarkable ease; one centimeter of decentration giving as many prism dioptries as the lens has dioptries of refraction. It enables us to measure the power of a prism combined with a spherical or a cylindrical lens more easily and readily than by any other method, and brings our lenses and prisms together upon the same basis of a uniform standard measurement distance of one meter.

In fine, the prism dioptry in accuracy, simplicity, ease of determination and width of application fulfills all requirements and leaves nothing to be desired as a method of numbering prisms. On the other hand the centrad, or centirad, as some prefer to call it,—is artificial, its principle is not recognized in optics, except by a few specialists in England, and it can serve no purpose that is not already served by the degree. It is based upon an angle corresponding to an arc equal to the radius, which is called a radian, and is equal to 0. 57295° +. The .01 ($\frac{1}{100}$) of this is called a centrad and is proposed as a unit for prism measurement, and it was so proposed by Dr. Dennett, the originator of the scheme, because he says: if you use glass with an index of 1.57233 one centrad will equal 1°. (As a matter of fact this is not strictly so, as his table shows). This unit, please observe, is angular and nothing else was originally claimed for it, and, therefore, as a unit, the same objections are to be urged against it as against the minimum angle of deviation, with many additional on its own account.

Dr. Randall has said, in a discussion of this question, that we cannot get away from angles in the deflection of prisms. That is true in a certain sense, but the centrad departs farther from the angle as universally regarded in mathematics to-day than any other proposed method. Dr. Randall actually proposes, in his enthusiasm for the centrad, to do away with degrees altogether and abolish one of the fundamental units of optical science, one which forms an essential part of the great and enduring works of Helmholtz, Gauss and the numberless others who have made optics, technical and physiological, what it is.

Enthusiasm is good, but let us keep it within the bounds of sanity. Now the prism dioptry does not propose to abolish anything that is ex-

istant and in general use; it proposes no revolution. It keeps degrees, minutes, seconds, signs and tangents just where they were, and you can find the value of any number of prism dioptries in those reciprocals if you should happen to want them. Suppose, for instance, you wish to find the sign or tangent of three centrads, you have first to multiply .57295 + by 3, convert this result into degrees, minutes and seconds and then find their reciprocal sign or tangent in the table. This difference is much magnified when it comes to the application of the centrad to the meter angle, particularly if high degrees are used, for the difference between the centrad and the angle increases very much as the higher numbers are reached, not as much, however, it must be said, as between the prism dioptry and the angle, but the value in angles, of the prism dioptry, considered as a tangent, is much more easily found than that of the centrad. But, after all, the convergence need not necessarily be expressed in values of angles for any practical purpose. It can be expressed more simply and easily in prism dioptries. If absolute angles are wanted, as they never will be, since the error falls much within the limits of the personal equation, that accuracy is, as we have said, easily obtained. It is nonsense to speak of 20 meter angles, as is sometimes done, in illustration. Twenty M.a. means a convergence of five centimeters and that can never be used, and if it is applied to a deficiency of the convergence (negative), it is a condition that should not be corrected by prisms, but by operation.

In fact, all the anomalies known under the name of muscular insufficiencies can be most readily reckoned by means of the prism dioptry. In making examination for heterophonia, I employ the following simple methods. On the black wall of my ophthalmoscopic chamber I have ruled a number of squares in white lines 6 cm. apart. The flame of an argand burner, turned somewhat low, is brought to a point opposite the crossing of two of these lines at the center of the system of squares. In producing the diplopia I do not use a prism or a maddox rod, but take a 6D cylinder from the trial case, and place it before one eye of the patient, who is 6 meters from the light. By causing the patient to look near one of the curved edges of the lens we get the prismatic action of the cylinder in the form of a broad streak of light projected above or below the argand flame in examining for exophosia and esophosia. This causes no lateral deviation whatever, even when the lens is tilted. It should be turned, however, until the broad light streak is perfectly vertical and if there is any deviation to the right or left from the line on which the argand light rests, the distance is noted in the number of squares—each one of which corresponds 1 P.D. at the distance of 6 m. We are then able to tell at a glance almost the character of the heterophona and its amount expressed in prism-dioptrie.

In practice it is not the custom to use prisms stronger than 4 P.D. for a single eye, and I challenge Dr. Randall to detect the difference between the deflection of a 4 P.D. prism of one centimeter on the arc and on the plane. The difference cannot be measured by any means we have at our command. By all means let us be as accurate as we can, but let us not go outside the limits of reason and practicability; and while straining at this gnat of a purely theoretical, almost imaginary error, let us not swallow the camel of a new system which will necessitate the unlearning of a great deal that we have been taught, and which strikes at the foundation of our whole system of optics and leaves us practically none the better off.

After all is said, that which gives the centrad system any semblance of virtue and assures it any claim for acceptance has been taken bodily from the prism-dioptry. They say that one can measure the deflection on an arc at one meter, or at any chosen distance. But did any of the advocates say that before Mr. Prentice, with what seems like a flash of genius, put forth the simple idea of taking the linear deflection as a measure of the prism and adopting as a unit one having one centimeter deflection at a meter's distance? Take the deflection measurement away from the centrad and it has no advantage over the minimum angle and has many disadvantages which the angle has not.

It would be absurd to suppose that a man of the profound mathematical knowledge of Mr. Prentice had not thought of measuring this deflection on the arc. The fact is that was one of the things he wanted to get rid of in his effort at reducing the measurement to the simplest conditions possible. We have planes everywhere, but a different arc must be constructed for every distance. The purpose of the prism dioptry in its inception was to offer to the optician and to the busy practitioner a method of measuring the power of the prisms used in ophthalmology that should be simple, accurate, readily practiced, with as little change in our present methods as possible, and should bring it into harmony with the accepted notation of lenses, the meter angle and the decentering of lenses. In doing this I think it has been marvellously successful. On the other hand the proposed centrad system asks us to abandon one of the established units in optics, to adopt a system which is not used in our ordinary text books on optical science, and to unlearn much that we have already acquired through the labors of our great teachers in mathematical optics, and which cannot be made useful in the decentering of lenses or in measuring prisms combined with lenses and, only by twist-

ing, can be made applicable to measuring the meter angle. The centrad, as now advocated, is the prism-dioptry with the exception that the deflection of the centrad is measured on the arc, that of the prism-dioptry on a plane. The difference between these for practical purposes, is infinitesimal.

It is the law laid down in all treatises on optics from Gauss to the present time that we are to consider the arc, sign and tangent in all calculations where lenses are concerned as the same. If these masters in science who, by the adoption of this principle, have made technical optics possible, can do this we certainly cannot err in adopting it. In fact we cannot ignore it if we would not throw ourselves out of line with all previous investigation and study.

You have the two systems before you; one simple, scientific, easily executed and in keeping with all previous work, the other entirely new, revolutionary, requiring special apparatus for its use and with its only commendable feature taken from the prism-dioptry.

DISCUSSION.

DR. DUDLEY S. REYNOLDS said that he regarded it a very important matter to have some established basis for the measurement of prisms. It was desirable also to have as accurate values as possible, and this system of the centrad he considered comes nearest it. He acknowledged that there was a very small difference between the centrad and the refracting angle, but the former is more absolutely accurate. The difference, while almost infinitesimal, is at the same time real and it is the principle, scientifically considered, that caused him to advocate the centrad system. In adopting a new system it should be as accurate as possible. The centrad is not new, however, having been used in science many years. It is essential in circular measure that there be angles, nor can they be done away with.

As to centering lenses, he has demonstrated that the decentering by displacing is measured by the centrads and not by prism-dioptrics.

DR. RANDALL said in closing, that he had laid most stress on the reform rather than the relative values of the prism dioptre and centrad. That he had already brought out in *The Med. News* of April 4th. His paper was a plea for accuracy, as rigid as possible, and he had demonstrated by the figures presented, that while the two units were generally identical, there were distinct differences even within the common practical limits and always in favor of the centrad. Our reform should introduce the minimum of change and the centrad changed only the unit, while the prism-dioptre changes both the unit and the method. As to the name, he feared that "prism-dioptres" would force "lens dioptres" upon us; and we were likely to lose rather than gain in clearness, when each 1, 2, 3, 4, or 5 dioptres of accommodation, was stated to be accompanied by some 3, 6, 9, 12 or 15 P.D. of convergence.

The Congress of American Physicians and Surgeons.

Dr. Samuel S. Adams, of 1632 K. Street, Washington, D C., has issued the following circular, dated August 8: I inclose herewith, for your information, a memorandum with regard to reduction of railroad fares for those attending the Second Congress of American Physicians and Surgeons. You will see from this that, to enable any member to obtain the reduction, there must be present at least one hundred persons holding special certificates. Will you, therefore, please notify me, without delay, as to whether you intend to avail yourself of this method of obtaining reduction in fare, and also whether you will be accompanied by any members of your family who will also desire to avail themselves of such reduction? Early in September the committee will inform you, by circular, as to whether one hundred persons or more have sent notice that they will avail themselves of this method of obtaining reduction, and will obtain special certificates for the purpose. In case there should not be one hundred persons who indicate their intention of doing this, only the ordinary reduction of rates on round-trip excursion tickets can be obtained by those coming to the Congress.

Reduction in Railroad Fares.—The Trunk Lines, the New York and Boston lines, the Southern Passenger Association and the Central Traffic Association, will transport persons from points on their lines to Washington and return, at the price of one and one-third the regular fare, on the following conditions: 1. There must be an attendance at the meeting of not less than one hundred persons holding special certificates. 2. The going ticket must be purchased within three days before the opening date of the meeting. 3. Each person availing himself of the concession must pay full first-class fare going to the meeting, and must obtain a certificate from the agent of whom the ticket is purchased. 4. Those holding such certificates, when countersigned by the proper officer at the Congress, can obtain return tickets at one-third the highest limited fare. *Certificates are not transferable, and the return tickets secured upon certificates are not transferable. If any of them are sold or transferred, they must be redeemed at the highest first-class rate by the person making such sale or transfer.* No refund of fare will be made on account of any person failing to obtain a certificate. Those who wish to avail themselves of this method of obtaining reduction in fares should present themselves at the office for certificates and tickets at least thirty minutes be-

fore departure of trains. It is absolutely necessary for each passenger, before starting, to obtain a certificate from the ticket agent of whom the going ticket is purchased, otherwise he can obtain no reduction in the return fare. There will be no stop-over privileges on the return tickets, which must always be by the same route as the going ticket. Members may obtain tickets on these conditions for their wives and members of their families, as well as themselves. Following is a list of the roads making these concessions:

Trunk Line Passenger Committee.—Reduction in Fare on Certificate Plan.—1. The reduction is to persons going to the meeting from Trunk Line territory—*i. e.*, from Niagara Falls, Buffalo, and Salamanca, N. Y., Pittsburgh, Pa., Bellaire, O., Wheeling, Parkersburg, and Charleston, W. Va., and points east thereof, except in New England. *List of Roads making the Concession:* Addison & Pennsylvania, Allegheny Valley, Baltimore & Ohio (Parkersburg, Bellaire, and Wheeling, and east thereof), Baltimore and Potomac, [1]Bennington & Rutland, Buffalo, Rochester, & Pittsburgh, Camden & Atlantic, Central of New Jersey (except locally between Philadelphia and New York), [1]Central Vermont, Chesapeake & Ohio (east of Charleston, W. Va.), Cumberland Valley, Delaware & Hudson Canal Co., Delaware, Lackawanna, & Western, Elmira, Cortland, & Northern, Fall Brook Coal Co., [1]Fitchburg, [1]Grand Trunk, Lehigh Valley, New York Central & Hudson River, New York, Lake Erie & Western (east of Salamanca and Buffalo), New York, Ontario & Western, New York, Philadelphia, & Norfolk, Northern Central, Pennsylvania (except locally between Philadelphia and New York), Philadelphia & Erie, Philadelphia & Reading (except locally between Philadelphia and New York), Philadelphia, Wilmington, & Baltimore, Rome, Watertown, & Ogdensburg (except on Phœnix Line—stations between Syracuse and Oswego), Western New York & Pennsylvania, West Jersey, West Shore.

New York and Boston Lines Passenger Committee.—List of Lines making the Concession, and Points thereon from which it applies: Boston & Albany R. R., New York & New England R. R., New York, New Haven, & Hartford R. R., New York, Providence, & Boston R.R., Old Colony Railroad, Fall River Line, Norwich Line, Providence Line, Stonington Line.

Southern Passenger Association, composed of the following companies: Alabama Great Southern Railroad, Atlantic Coast Line, Atlantic & West Point Railroad, Brunswick & Western Railroad, Charleston and Savannah Railway, Central Railroad of Georgia, Cincinnati, New Orleans, & Texas Pacific Railway, East Tennessee, Virginia, & Georgia Railway, Georgia Railroad, Georgia Pacific Railway, Illinois Central Railroad; (*Lines South of the Ohio River*) Jacksonville, Tampa, & Key West Railway, Louisville & Nashville Railroad; (*Lines South of the Ohio River*) Louisville, New Orleans, & Texas Railway, Mississippi & Tennessee Railroad, Mobile & Ohio Railroad; (*Lines South of the Ohio River*) Memphis and Charleston Railroad, Nashville, Chattanooga, & St. Louis Railway, New Orleans & Northeastern Railroad, Norfolk & Western Railroad, Pennsylvania Railroad; (*Lines South of Washington*) Port Royal & Augusta Railway, Raleigh & Gaston Railroad, Richmond & Alleghany Railroad, Richmond & Danville Railroad, Richmond, Fredericksburg, & Potomac Railroad, Rome Railroad, Savannah, Florida, & Western Railway, Seaboard & Roanoke Railroad, Shenandoah Valley Railroad; (*Lines South of Potomac River*) South Carolina Railway, Vicksburg and Meridian Railroad, Western & Atlantic Railroad, Western Railway of Alabama.

Central Traffic Association.—The territory of the Central Traffic Association is bounded on the east by Pittsburgh, Salamanca, Buffalo, and Toronto; on the north by the line of and including points on the Grand Trunk Railway, from Toronto to Port Huron, thence via Lake Huron and Michigan to the north line of Cook County, Illinois; on the west by the west line of Cook County and the Illinois and Mississippi Rivers to Cairo, including Burlington, Keokuk, Quincy, Hannibal, and St. Louis; and on the south by the Ohio River, but including points on either side of that river.

[1] Only for business originating at, or destined to, stations on the direct lines of these roads between Troy, N. Y., and Montreal, Can.

AMERICAN RHINOLOGICAL ASSOCIATION.—The ninth Annual Meeting of the Association will be held in Indianapolis, Ind., October 6, 7 and 8. The meeting promises to be an interesting one. Papers are promised, among others, as follows: "Nasal Stenosis from Inflammatory Action," by Dr. Christopher, St. Joseph, Mo. "The Abuse of the Galvano-Cautery in the Treatment of Diseases of the Ear, Nose and Throat," by Dr. Cheatham, Louisville, Ky; "Sarcoma of the Nasal and Pharyngo-Nasal Carities," by Dr. Reinbold, St. Louis, Mo.; "The Voice Treatment of the Nose and Throat," by Dr. Hobbs, Atlanta, Ga.; "Surgery of the Nasal Forsæ," by Dr. North, Toledo, O.; "When Ante and when Post-Nasal Catarrh," by Dr. von Klein, Cleveland, O. Other papers are promised and some from applicants for fellowship in the Association.

President, Dr. R. S. Knode, Omaha, Neb., Secretary, Dr. E. R. Lewis, Indianapolis, Ind. Inquiries may be addressed to either of the above officers.

ARISTOL IN IVY POISONING.—Dr. J. J. Levick reports a case in which severe poisoning from rhus toxidendron was promptly much relieved by the free dusting o powered aristol on the affected parts.

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This is obtainable, at any time, by a member of any State or local Medical Society which is entitled to send delegates to the Association. All that is necessary is for the applicant to write to the Treasurer of the Association, Dr. Richard J. Dunglison, Lock Box 1274, Philadelphia, Pa., sending him a certificate or statement that he is in good standing in his own Society, signed by the President and Secretary of said Society, with five dollars for annual dues. Attendance as a delegate at an annual meeting of the Association is not necessary to obtain membership. On receipt of the above amount the weekly JOURNAL of the Association will be forwarded regularly.

SATURDAY, AUGUST 29, 1891.

LINEAR CRANIOTOMY.

At the meeting of the Association last May, KEEN, of Philadelphia, read a paper on this subject, which appeared in a recent number of THE JOURNAL. DR. KEEN very properly objects to the term craniectomy, originally proposed by LANNELONGUE, and suggests instead linear craniotomy. The operation consists essentially of an incision through the cranium, usually parallel to the sagittal suture, but not necessarily so. KEEN reports eight cases, three of which he operated, two by LANNELONGUE, and one each by GERSTER and SACHS, WYETH, and MCCLINTOCK. GERSTER and SACH'S case and one of KEEN'S died shortly after the operation. In WYETH'S case the operation was quite different from that ordinarily done. He made two incisions through the skull, ¾ of an inch apart, and extending from a point just above the eyes to the occipital protuberance. Lateral incisions were then made at each end of these incisions, and also in the middle, and the four flaps of bone thus formed were forcibly torn apart, widening the original incisions by ¾ of an inch. The result in this case was satisfactory.

At the meeting, early in April, of the Fifth French Surgical Congress, LANNELONGUE reviewed this subject, basing his remarks on twenty-five operations.[1] LANNELONGUE finds an indication for linear craniotomy in a number of other conditions besides microcephalism, with its premature closing of the sutures. In the so-called obstetrical compression, whether occurring during birth, or as the result of intra-uterine pressure during gestation, the operation appears to be indicated. Meningeal hæmorrhage in young subjects, circumscribed pachymeningitis, serous cysts, hyperostoses due to hereditary syphilis, certain forms of hydrocephalus, accompanied with thickening of the bones and premature closing of the sutures and fontanelles, all point to linear craniotomy as the proper mode of relief.

LANNELONGUE makes two operations, the "linear craniectomie," as he continues to term it, and "*craniectomie à lambeaux*." Besides the form already described, LANNELONGUE has made a transverse craniotomy in the frontal bone, and in the occipital bone. The "*craniectomie à lambeaux*," or flap craniotomy, consists in running the incisions so as to leave variously shaped bony flaps, after the manner of WYETH'S operation, already referred to. This is the operation which LANNELONGUE is more and more frequently performing. Sometimes the flap includes a single bone, as the frontal or parietal, sometimes portions of two bones. The incisions are made in the shape of a T, a V, a U, a rectangle, or a horseshoe. As to the periosteum, the results are the same, whether it be resected or not. If the dura mater be cut, it should be sutured. The danger from hæmorrhage is unimportant; the meningeal artery and its branches are uncovered without danger. Great thickness of the cranium, hyperostosis, eburnation of the bone, present no difficulties.

In twenty-five operations he reports twenty-four operative successes, one death in 48 hours from acute septicæmia or loss of cephalo-rachidian fluid. Three times suppuration occurred, the longest duration being three weeks. No necrosis was seen. The youngest child was 8 months, and the oldest 12½ years. As to symptomatic results, he says that a very great number of the little patients have been improved either in intelligence or ability to walk.

In the discussion which followed, ANGER reported a case in a girl of 8 years, who was much improved. LARABRIC reported an operation by HEURTAUX on a child of 5 months, who died two months later without having shown any improve-

[1] Revue mensuelle des Maladies de l'Enfance, May, 1891.

ment. A most important case was reported by MANOURY, of Chartres, October 20, 1890; he made the linear operation on a four year old microcephalic girl who had never been able to walk or stand, who had double talipes equinus, who constantly moved the upper extremities, and who never pronounced a single syllable and was unable to chew her food. Immediately after the operation, the movements ceased, the talipes disappeared, the head was held up; and the face became more intelligent. The child chewed its food and was able to stand. This condition continued for two or three months, when gradually all the former troubles returned. Measurements of the head before and after the operation revealed no differences in size. The same operator reported a fatal case in a child of two years, death occurring by convulsions, twenty hours after the operation.

The latest American case reported seems to be that of DR. WM. H. MORRISON of Philadelphia, who successfully operated on a boy 2½ years old, April 17, 1891.[2]

It is too early to derive conclusions from the operations reported, but it seems that the operation *per se* is not particularly dangerous and even if only occasional permanent good results are obtained, the operation should be made. No more pitiable objects exist than the unfortunate victims of microcephalism, with their idiocy, their paralyses, their general mental and physical incompetence, and they are certainly entitled to anything which may offer some prospect of relief. Education offers but little hope, and we have no other treatment at our disposal, so that the performance of craniotomy is not only justifiable, but a duty in these cases. With a view to the relief of certain cortical centers, it is possible that in individual cases the particular location of the incisions may be determined by the symptoms present.

THE USE OF MENTHOL IN PRURITUS.

Menthol has been found useful in the summer irritations of the skin, including those following the bites of mosquitoes, fleas and other insects. One part of menthol added to eight or ten parts of alcohol, or cologne water, will relieve not a few persons, but not all; at all events it is a pleasantly soothing and cooling application. Some forms of head-ache, or brow-ache, are speedily relieved by the lotion containing one part in ten of menthol, the same being applied by rubbing, over the forehead and temples, with the hand or dampened muslin. Mixtures of menthol in glycerine and water have been commended for like purposes, but are not so suitable as the lotion above mentioned for use about the face, head and hands.

[2] Medical Record, July 18, 1891.

THE RELATION OF FUNCTIONAL DISORDERS OF THE HEART TO DISEASES OF THE ABDOMINAL VISCERA.

Under the above title DR. SEYMOUR TAYLOR presents a suggestive paper in the July number of *The Practitioner*. The matter is purely clinical, unaccompanied in any case reported by post-mortem examination, which is to be regretted, although to be commended as a report of careful clinical observation, after the manner of our forefathers, a habit altogether too much in disuse at present. The term "functional heart disorder" he uses in the sense as disturbed cardiac action in the absence of disease of the valves or muscular walls of the heart. He notes three cases of tachycardia, or heart hurry, and twelve of bradycardia, or slowness of pulse. The cases of tachycardia were characterized by suddenness of onset, being excited by such slight causes as a sudden noise, or mental emotion. The attacks would terminate with equal suddenness. Dangerous syncope was frequently present and two of the cases died during an attack.

In one of the cases, the pulse rate reached 200, and in another 270 per minute. The only discoverable structural lesions were in one case, a movable kidney, in another a large uterine tumor, and retroversion, and in the third enlarged prostate with chronic cystitis.

ORD has distinctly shown that a reflex destructive or dystrophic change occurs in the skin and joints secondary to uterine, or prostatic or urethral disease. Assuming a causal reflex nervous influence, TAYLOR thinks that the original irritation from the abdominal or pelvic disease may act higher in the cord and be reflected to the cord causing a motor disturbance.

Of the twelve cases of slow or intermittent heart action, three occurred after enteric fever, five in cases of chronic bladder and prostatic trouble, three had chronic bowel trouble, and in

one, pregnancy was the abdominal trouble. A diminished pulse rate and subnormal temperature are not uncommon after typhoid fever.

The cases cited are by no means proof of a causal relation between abdominal lesion and functional heart trouble, nor is it clear that the effects of nutritional disturbances, or of cardiac obesity have been eliminated, yet still they make it desirable that possible connections of this type should be more closely noted.

ON THE VALIDITY OF STATISTICAL PROOF IN MEDICINE.

The following axiomatic statement occurs at the head of a book review in a recent number of the *Lancet*: "The true and sufficient reply to the oft-quoted allegation that one can prove anything by statistics is that without them one can prove nothing." This is putting the case in strong language, to say the least, and yet there is so much in it of rebuke to those who would belittle the authority of statistical statement that we would be glad if we could give emphasis to the quoted paragraph, with the name of its acute composer. When we reflect how much in the past history of scientific medicine has been due to the master in statistics, and how much in future must depend upon him, we stand ready to honor the philosopher who could indite so clear and righteous a decree.

THE MEDICAL BUREAU OF THE COLUMBIAN EXPOSITION.

This very necessary adjunct to the great Fair was organized June 1, 1891. Staff: Jno. E. Owens, M.D., Medical Director; W. H. Allport, N. R. Yeager, S. C. Plummer, Assistant Surgeons.

The Bureau took charge of medical, surgical, and sanitary inspection work on the grounds July 1, 1891, and is now in active operation.

A temporary dispensary and emergency hospital has been constructed, where medical and surgical attendance and medicines are furnished to employes during the day free of charge.

The Bureau is amply equipped with instruments, medicines, operating room furniture, stretchers, cots, and an orderly. The City Police Department has furnished a patrol wagon for ambulance service to be used until a permanent ambulance has been constructed, and the Exposition company provides horses, harness and driver.

The present Bureau operating during the construction period will be the nucleus of the medical service of the World's Fair. It is the intention of the Medical Director to make the records of the Bureau as complete as possible from a statistical and historical standpoint, and to furnish at the close of the service a report which will be valuable in the organizations of the Medical Bureaus of future Expositions.

Present number of persons living or working on the grounds is 2,000, increasing weekly. Several accidents have already occurred, and the Bureau has had ample opportunity to demonstrate its right to existence.

NECROLOGY.

Richard Lea McDonell, M.D.

Dr. Richard Lea McDonell, of Montreal, died July 31, aged thirty-eight years. He was professor of clinical medicine at McGill University and physician to the Montreal General Hospital. He was the son of an accomplished physician from whom he inherited fine intellectual powers and an unquenchable fondness for medicine. He was one of the best and most popular among the junior professors in the University, being notable for his punctuality and careful preparation as well as for his fine literary capacity and a ready diction. He was active in the medical societies and with his pen in both American and English periodicals. About two years ago he was taken with a severe pulmonary hæmorrhage, which impelled him to give up his professional work for a year, and to travel in Europe. He spent most of this time among the Alps, and his health was so far improved that there appeared to be an arrest of the disease. He resumed work, and during the last session of the college was in vigorous health, and so continued until a few weeks since. But his pulmonary troubles returned and advanced rapidly during July, carrying him off in the prime of life, a sacrifice to tubercular phthisis.

John Joseph Cochran, M.D.

Surgeon John Joseph Cochran, U. S. A., died August 6, at the St. Luke's Hospital, New York City. He was a native of Cambridge, Mass., from which State he was appointed to the Army about ten years ago. He was an alumnus of the College of Physicians and Surgeons, New York, of the class of 1876, and for a short time served as surgeon on one of the Cunard liners, directly after his graduation. He attained to the grade of captain in 1885. His fatal illness was typhoid fever.

BOOK REVIEWS.

A TEXT-BOOK OF THE DISEASES OF THE EAR. By DR. JOSEF GRUBER, Professor of Otology in the Imperial Royal University of Vienna, etc. Translated from the second German Edition, by special permission of the Author, and edited by Edward Law, M.D., C.M., Edin., M.R.C.S., Eng., Surgeon to the London Throat Hospital for Diseases of the Throat, Nose and Ear, and by Coleman Jewell, M.B., London, M.R.C.S., Eng., late Physician to the London Throat Hospital. With 150 Illustrations and Seventy Colored Figures on two Lithographic Plates. New York: D. Appleton & Co., 1, 3 and 5 Bond St. 1890. Compliments A. C. McClurg & Co., 117–121 Wabash Ave., Chicago. Price $5.00.

Those who are specially interested in the study of diseases of the ear and their treatment, will recognize the thoroughly helpful work which has been accomplished by Professor Gruber. Himself a self-taught man, he has not forgotten the successive steps of progress by which he has attained his present eminence as a practitioner and teacher, and from his personal experience, he is the better able to conduct his students along the ways now so familiar to him. His English editor, Professor Law, his former pupil, assisted at the first by the late Dr. Coleman Jewell, appreciating the value of the work, has given to the English-speaking people a fine translation of the same, and the publishing house of D. Appleton & Co., New York, have placed upon the American market an exceptionally fine edition of this excellent work.

Recognizing the absolute importance of a critical knowledge of the anatomical structure of the parts which, directly or indirectly, may be involved in diseases of the ear, the author has performed this part of his work in a most creditable manner. In the present edition, it has been submitted to the able supervision of Dr. Howden, Lecturer on Anatomy in the University of Durham College of Medicine, and the thoroughness with which his work is done leaves little more to be desired. So far as we can judge, the illustrations are original, and in each instance they are exceptionally fine. When we come to consider the functions of the several parts of the aural organism, we are confident that less progress has been made than in the study of almost any other organ or structure of the body. For instance, who of all our investigators, is fully satisfied in his own mind as to the physiology of the labyrinth? Then again, such are the minuteness and delicacy of the structures that, in the progress of disease, rarely is one alone involved, often rendering it exceedingly difficult to determine which is responsible for a given set of symptoms manifested during life.

One by one the component structures are carefully considered, their physiological uses, according to the author's view, are stated, and their diseases and treatment clearly set forth. Ample instruction is given for the proper examination of patients. The instruments needed in the treatment of aural affections are well described and illustrated. With such a work at hand, there is no excuse for that amount of uncertainty, and of positive ignorance, which so largely prevails among the masses of the profession, with reference to the diseases of the aural organism, and the most approved methods of treatment.

DOMESTIC CORRESPONDENCE.

LETTER FROM NEW YORK.

(FROM OUR OWN CORRESPONDENT.)

As a considerable portion of the last letter was devoted to the ambulance service of the city, in connection with the report of the grand jury's committee, a few particulars in regard to the life of the ambulance surgeon in our hospitals may perhaps be of interest. This responsible official usually sleeps on a cot immediately above which are placed two large gongs. One is the regular fire gong, and when an ambulance call is sent through the fire-box this rings 20, and then the number of the district. The othes gong connects with the telephone, which keeps on ringing till he awakes and pulls a string for it to stop. As soon as he hears the call he touches a button which gives the signal at the stable, where the horses are trained to spring to their places in the same way that the fire department animals answer an alarm. The ambulance surgeon is allowed from three to five minutes in which to dress and get to his position on the ambulance.

When two districts lie close together it is a point of honor to see which ambulance will be first on the ground; consequently there is considerable rivalry as to which brings in the case. It is related that on one occasion when a case occurred about the middle of the new Washington bridge on the Harlem, the ambulances from two different hospitals simultaneously arrived at opposite ends of the bridge. There was then a hot race to get to the patient first, and as both of the ambulances dashed up exactly at the same minute, there was considerable wrangling between the rival surgeons and drivers as to which hospital was entitled to him.

The ambulance surgeons sometimes have some very exciting experiences, as well as sometimes very amusing ones, and when a young man first goes on to this service he is likely to find his position a very trying one. All drunk and insane cases are, as a rule, required to be taken to Bellevue, and if the patient has to be carried from a long distance as Harlem, for instance, the ambulance surgeon's lot is not always a happy one during the drive. One of them relates one of his experiences as follows: "One Sunday when I was coming down through the

Park and Fifth avenue with a case of delirium tremens I didn't know but I would have to be taken inside with nervous prostration myself before we got through. That miserable wretch would wait till we got right in the midst of a lot of swell turnouts, with ladies and children inside and solemn coachmen and footmen on the outside, and then he would let forth the most fiendish yells and shrieks, and struggle until it seemed that he would break every strap which held him down. Sometimes the horses near by would shy, the ladies would look frightened half to death, and everybody would gaze at me in a manner that was extremely depressing to a quiet, retiring sort of a man. On arriving at the hospital the patient insisted that we had kept a big black dog in with him all the way, and that the beast had bitten him several times." Not infrequently impostors and maligners, who want to have a few days comfortable lodging and board free, contrive to get taken to the hospitals, especially after dark; but when, as is often the case, the actual cautery is prescribed for the treatment of the supposed injury or disease, it takes an astonishingly short space of time to get rid of this class of patients. The sight of the iron, even before it is heated, is generally sufficient to produce an instantaneous cure.

Among the Sisters of the Poor of St. Francis who have charge of the nursing in St. Francis' Hospital, which is situated on the east side of town, in the midst of a dense German population, is one, Sister Emerana, who, by her life of devoted zeal for the relief of suffering and sorrow, has won for herself among the hospital people the title of "Captain of the Wretched." She was born in Germany, and at an early age assumed the vows of the religious life. When the Franco-Prussian war broke out, she left the peaceful convent where she resided for the battle-field, and did heroic service as a nurse in the camp hospitals attached to the German army. It sometimes happened that the wounded were brought in in such numbers that it was impossible to give them all immediate surgical care, and the brave young nurse had to do what she could to supply a surgeon's place. She thus gained an experience in practical surgery and the dressing of wounds that has since proved of the greatest value. At the end of the war she labored for a time in the various hospitals established by her religious order in Germany, and some years ago came to America. At St. Francis' Hospital she is invaluable as a nurse and as an assistant at operations, and in the outdoor department, where every morning a number of patients crowd in from the street to have their wounds dressed, a large part of the work is done by her. At the same time she humbly takes her share in the daily scrubbing of the hospital wards, and although possessed of great natural capacity to govern others, she is always rigidly obedient to the rules of her order. In any sphere of life Sister Emerana would have been a remarkable woman. In that which she has chosen she furnishes a beautiful example of heroic self-sacrifice, leading her little company courageously forward in the grim battle with suffering and death; lifting up the fallen, cheering the faint-hearted, and soothing the last moments of the dying.

The newspapers report the case of a patient in St. Joseph's Hospital, in the neighboring town of Paterson, N. J., who practically fasted for sixty days, although he did take a cup of tea or a glass of water from time to time. Some two months and a half ago the man was admitted, suffering from an injury to the spine which it was thought would prove fatal. He was unable to retain food, and, losing all taste for it, he determined to do without eating for a time. He was carefully watched, and although he became excessively emaciated, he remained cheerful, and stated that he felt much better than when he attempted to eat. At the expiration of sixty days he said that he felt like eating something, and "thought he would like a piece of home-made pie." The account does not mention whether his physicians gave their consent to the patient having his pie, but at all events, it was given him, and it is stated that from that time he began to improve rapidly, and now expects soon to leave the hospital quite well.

In the case of a laborer who was overcome by the heat one day recently during the hot weather, and who was taken to the Presbyterian Hospital, the patient's temperature is said to have reached the extreme point of 111°. The man recovered.

One would hardly select a crowded excursion barge on the Hudson River as a place of accouchement, yet the other Sunday an Irish woman gave birth to a child, without medical assistance, on a trip of this kind, in only such seclusion as the captain's cabin afforded. There were altogether five thousand people on board the two barges used for the excursion, dancing and otherwise enjoying themselves, and the rapidity with which the news, "it is a boy," spread among them, is said to have been something extraordinary. P. B. P.

MISCELLANY.

MESSRS. J. B. LIPPINCOTT COMPANY announce that they will publish, about September 1st, the eighth edition of Wood's Therapeutics; its Principles and Practice; rearranged, rewritten, and enlarged. Scarcely three years have elapsed since the appearance of the seventh edition, yet the preparation of the present volume has necessitated a careful study by its author of more than seven hundred memoirs. In the present edition no revolutionary changes have been made comparable to those of the seventh revision, but great care has been exercised to see that every portion of the work has been thoroughly revised, and a number of the articles have been completely rewritten, while some new drugs have been noticed. Among those portions of the book which are practically new may be mentioned, as important, the whole subject of anæsthetics, the articles upon cocaine, strophanthus, caffeine, antipyrin, antefebrin, phenacetin, hydrastine, paraldehyd, lead-poisoning, etc. Among the absolutely new articles may be mentioned sulphonal, chloralamid, aristol, and others.

RESIGNATION OF A QUACK EXTERMINATOR.—Dr. John H. Rauch, the efficient Secretary of the Illinois State Board of Health since its organization in 1878, and prior to that of the Chicago Board of Health, has resigned. He was the terror of quacks and ignorant pretenders, for whom he made it so hot in Illinois that they had to seek hospitality in neighboring States. His

chosen motto was "down with quackery!" or words to that effect, though as an official he was a man of action rather than words. His warfare against the parasites was not mere smoke—there was fire behind it, a smoldering magazine, as the miscreants soon found out to their sorrow. He not only drove them out of Illinois, but his method of dealing with them was contagious, and other States caught the idea and enacted laws for the suppression of quackery patterned after that of Illinois. He was also an indefatigable worker in the department of sanitary science and inaugurated many reforms in the administration of public health affairs in Illinois. It has been chiefly through his work that the standard of medical education throughout the country has been elevated to its present position, for the requirements of the Illinois State Board of Health have been largely instrumental in developing a more thorough course of instruction upon the part of medical colleges. In his resignation the Board sustains an irreparable loss.

CAFFEINE.—Dr. Gempt urges the use of caffeine in cases of threatened collapse in various asthenic diseases, but especially in acute pneumonia, and cites several cases in which it was successfully used in conjunction with stimulants. He believes the drug indicated in the course of acute pneumonia when there is evidence of cardiac failure, such as rapid, irregular pulse with lowered tension. Should the pneumonia be of asthenic type, it should be used from the onset, and the earlier in the course of the disease it is used after asthenia develops the better. In cases of this sort, caffeine, in doses of .35 gram four to five times daily, raises the arterial tension, diminishes the rate of the respiration and pulse and lowers the temperature. Its action is prompt, but in urgent cases it had better be used hypodermically. It is advisable to continue it for a brief period after the febrile defervescence.—*Boston Med. and Surg. Journal.*

AN IMPROVED METHOD OF GRAFTING ULCERS.—Having had an exceptionally large number of chronic ulcers of the leg, which incapacitated the patients from work, and finally brought them into the infirmary, I tried the ordinary methods of grafting, but being disgusted with the very large number of total failures I experienced, I undertook various experiments, and at last adopted the following plan, which I distinctly disclaim as my own, but which consists in adopting and combining the ideas of several people. The success I obtained with this method was so marked that I think a large number of practitioners at home and abroad (in India especially, where I found all ulcers very intractable under ordinary treatment) will welcome it. Even when the ulcer is deep, with hard thickened edges and extending all round the limb, the method applies. This is to cleanse the surface well for two or three days with boracic fomentations, and then (contrary to what I was taught) slightly abrade the granulations, just sufficient to cause oozing, and apply the graft directly to the abraded surface, where it is held in position by a small pile made of half-inch squares of green protective, four or five squares being placed one on the top of the other. A graft is thus applied to every square inch of surface. And now comes the most important thing of all, and which is an idea I received from a friend. This is to encircle the limb with a fold of carbolic gauze, which extends two or three inches above and below the ulcer, where it is attached to the sound skin by collodion. The ulcer is then thoroughly dredged with boracic powder through the gauze, and the whole is wrapped in a layer of wet boracic lint, which is kept thoroughly moist. As a rule, the dressing is not disturbed for three days, when the lint is removed, and the limb well irrigated with boracic lotion, the grafts remaining perfectly secure under their heaps of protective, which is again kept in position by the gauze.

The limb is then redusted with boracic powder, and done up in the wet lint, which is now changed daily. At the end of ten days the gauze and protective are removed, and each graft will be found as large as a sixpence, while those near the edges will have exercised a spermatic influence, and caused a rapid ingrowing of epithelium. Since adopting the above plan, I may say I never lost a single graft, though employed on most unfavorable surfaces—a very different result to the old way of covering the grafts with a large piece of protective which retained some exudations under it, and thus bathed the tender graft in a poisonous medium, with a result that 80 per cent. of them never "took."—Gill, *The Lancet.*

SPINAL INJURIES.—If your patient is really suffering from a spinal lesion, you may expect to find one or more of the following *objective* symptoms to exist, to-wit:

1. Emaciation. Generally most noticeable in groups of muscles deprived of normal nerve stimuli.
2. Fibrillary twitchings and tremors of individual muscular bundles.
3. Flushings, generally confined to face or upper portion of body.
4. Heart and pulse couditions, if abnormal and not existing before injury, may reasonably be referred to the injury.
5. Ephidrosis, indicating a depressed nervous condition.
6. Cold extremities, a symptom not possible to feign.
7. Cyanosis.
8. Pupillary dilatation, indicating nervous irritation.
9. Condition of reflexes.

In conducting the examination in medico-legal cases avoid leading questions.

It is my custom to let patients describe their symptoms or tell their story without the least suggestion from me. It is your duty to ascertain if your patient has read any work upon spinal injury since the accident, and before arriving at a definite diagnosis consider the patient's former character, especially as to veracity.

I believe it well to make repeated examinations, as different examinations may reveal widely different results.

In conclusion, you will find it impossible to arrive at your diagnosis from any one or any two symptoms, but rather from the aggregate phenomena that go to make up the clinical picture.—*Millard, N. W. Lancet.*

STERILIZATION OF CATGUT.—C. Brunner (Zurich) recommends the following method for the sterilization of catgut:

Place for one or two days in ether, then place in xylol, using a preserve glass, and heat in a sterilizing apparatus for three hours, wash with alcohol to remove the xylol, and keep in a solution of 1 part sublimate, 900 parts absolute alcohol, and 100 parts glycerine. After three days the catgut is ready for use. Before using pass the catgut through a sublimate solution (aqueous).—*Beiträge zur Klin. Chirurgie.*

Official List of Changes in the Stations and Duties of Officers Serving in the Medical Department, U. S. Army, from August 15, 1891, to August 21, 1891.

Lieut.-Col. Joseph C. Baily, Asst. Medical Purveyor, granted one month's ordinary leave, in extension of sick leave.

Asst. Surgeon Charles M. Gandy, U. S. A., will, upon the final adjournment of the Army Medical Board, resume his leave of absence.

Official List of Changes in the Medical Corps of the U. S. Navy, for the Week Ending August 22, 1891.

P. A. Surgeon W. R. DuBose, ordered to duty at Naval Academy, Annapolis.

Surgeon G. E. H. Harmon, detached from Naval Academy, Annapolis, and wait orders.

Surgeon Howard Wells, ordered for temporary duty at Naval Station, New London.

Medical Inspector A. A. Hochling, Surgeon J. B. Parker, and P. A. Surgeon O. D. Norton, ordered to Naval Academy, Annapolis, September 3, to examine physically candidates for admission to the Naval Academy.